AVIATION WEEK

NOV. 5, 1951

50 CENTS

Grumman

WHY PANTHERS PULL NO PUNCHES

Over the foaming wake of its carrier, one of our Navy's most aggressive fighters, the GRUMMAN PANTHER, comes in low for landing. Since early in the Korean War, PANTHERS have demonstrated two traditional Grumman characteristics. The ability to hit hard and the [illegible] punishment and retur[illegible]

GRUMMAN AIRCRAFT ENGINEERING CORPORATION, BETHPAGE [illegible] ISLAND, NEW YORK

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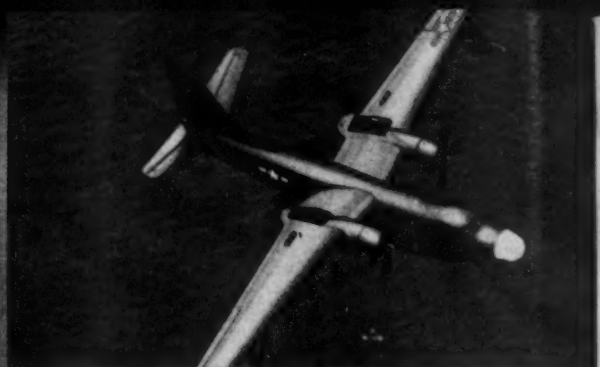
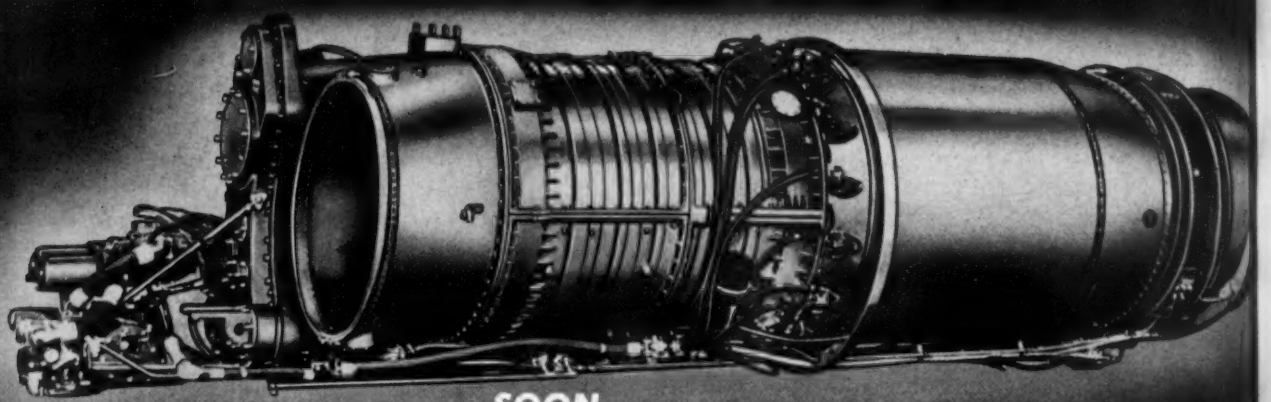
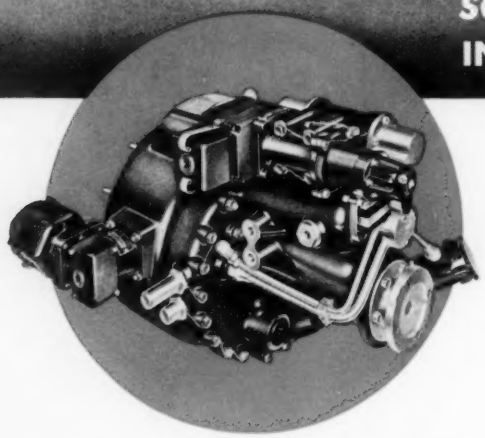
FIRST ON CONSOLIDATED'S B-36



NEXT ON THE NEW MARTIN P5



SOON...
INTEGRAL PART OF NEW WESTINGHOUSE J



Proved reliability increases acceptance of Sundstrand Alternator Drive!

Truth of the old French proverb "Nothing succeeds like success" is once again proved by the rapidly increasing acceptance of Sundstrand's Constant Speed Alternator Drive. On the B-36, more than 6500 hours of trouble-free operation have been logged. Test runs of Martin's new P5M-1 further verify its dependability. And now it is to become an integral part of the new J-40 engine. Other applications are "in the works," utilizing Sundstrand's *reliable* research, *expert* engineering, and *precision* production.

SUNDSTRAND

SUNDSTRAND AIRCRAFT HYDRAULICS

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B.F.Goodrich

5,000 landings per lining reported with B. F. Goodrich brakes

WEST COAST AIRLINES' fleet of DC-3's has so many short flights that landings have to be made every 20 minutes on the average. Maintenance costs were extremely high because the brakes they were using gave too few landings per lining. Wasn't there some way to reduce that cost?

Their engineers had heard of B. F. Goodrich Expander Tube Brakes. They decided to change over all their planes. Now they are able to report over 5000 landings per lining. Maintenance costs have been reduced 60%. Savings to West Coast have far more than made up for the initial cost of the changeover.

One reason why B. F. Goodrich Expander Tube brakes last longer is because the braking action covers a *full circle;* wear is spread more evenly. The design of the brake gets rid of heat better, adding to the life of the parts. Retractor spring action eliminates wear due to drag.

Simple design of the brake makes maintenance easier, reducing in-shop time. Only tools needed to reline it are a screwdriver and pliers. Because the expander tube applies pressure directly to the brake blocks, extra parts and linkages are eliminated.

There are other advantages. Expander Tube brakes can be designed lighter for a given amount of kinetic energy than any other brake.

They cannot lock or grab. They respond more smoothly to pressure. They can take heavy overloads better in emergencies. Another product of B. F. Goodrich research and engineering, the Expander Tube brake can be designed into any type of plane, large or small. Write: *The B. F. Goodrich Co., Aeronautical Division, Akron, Ohio.*

B.F.Goodrich
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Aviation Week

ABP Member ABC

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Erwin J. Bulban.....Special Assignments
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Editorial Offices: 330 West 42nd St., New York 18, N. Y., Phone Longacre 4-3000, or (night) 4-3035; National Press Bldg., Washington 4, D. C., Phone National 3414.

Domestic News Bureaus: Atlanta 3, Rhodes-Haverty Bldg.; Chicago 11, 520 N. Michigan Ave.; Cleveland 15, Hanna Bldg.; Detroit 26, Penobscot Bldg.; Los Angeles 17, 1111 Wilshire Blvd.; San Francisco 4, 68 Post St.; Houston, 514 South St. *Correspondents* in more than 60 major cities.

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November 5, 1951 — AVIATION WEEK — Vol. 55—No. 19

Member ABC and ABP

Published weekly by McGraw-Hill Publishing Company, Inc., James H. McGraw (1860-1948), Founder. **Publication Office: 99-129 North Broadway, Albany 1, N. Y.**

Executive, Editorial and Advertising Offices: McGraw-Hill Building, 330 W. 42nd St., New York 18, N. Y. Curtis W. McGraw, President; Willard Chevalier, Executive Vice-President; Joseph A. Gerardi, Vice-President and Treasurer; John J. Cooke, Secretary; Paul Montgomery, Senior Vice-President, Publications Division; Ralph B. Smith, Editorial Director; Nelson Bond, Vice-President and Director of Advertising; J. E. Blackburn, Jr., Vice-President and Director of Circulation.

Subscriptions: Address correspondence to AVIATION WEEK—Subscription Service, 99-129 N. Broadway, Albany 1, N. Y., or 330 W. 42nd St., New York 18, N. Y. Allow ten days for change of address.

Please indicate position and company connection on all subscription orders.

Single copies 50¢. Subscription rates—United States and possessions, $6 a year; $9 for two years; $12 for three years. Canada, $8 a year; $12 for two years, $16 for three years, payable in Canadian currency at par. Pan American countries, $10 a year; $16 for two years; $20 for three years. All other countries, $20 a year; $30 for two years; $40 for three years. Entered as second-class matter, July 16, 1947, at the Post Office at Albany, N. Y., under Act of Mar. 3, 1879. Printed in U. S. A.

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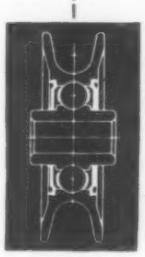
Slick airways inc.

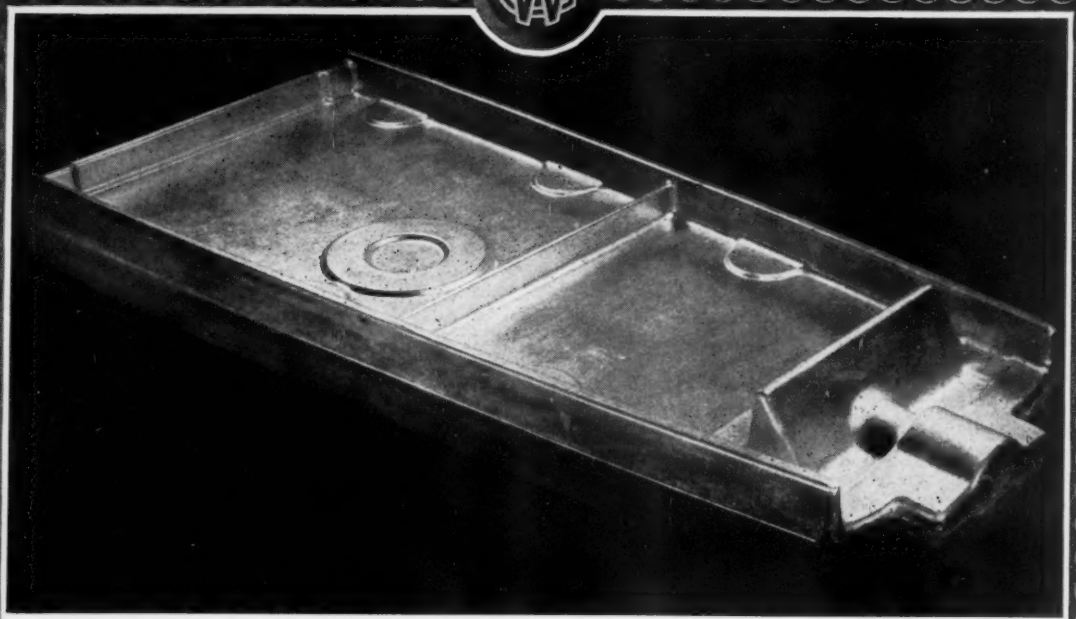
5 YEARS

FAFNIR

Carrying 45,612,511 ton-miles of air freight in 1950 is the record achievement of Slick Airways, the nation's largest carrier of domestic air freight. Nine hour coast-to-coast scheduled service is another spectacular achievement. It is significant that Slick Freight Planes have been equipped with Fafnir Aircraft Ball Bearings since the company's beginning . . . either as original equipment or replacement. Behind this long-established custom is something more than just good bearings. It's a Fafnir attitude and aptitude . . . a way of looking at ball bearings from the user's side, an aptitude gained from twenty-three years' specialization in aircraft ball bearings. The Fafnir Bearing Company, New Britain, Connecticut.



Fafnir Fairlead Type Ball Bearing, one of the Fafnir Ball Bearings regularly specified by Slick Airways. It fully meets Air Force and Navy Anti-Friction Control Bearing Specifications.



Are you taking full advantage of the constantly growing range of forgings? Typical is this aluminum alloy forging with a projected area of more than 1,000 square inches used in the wing structure of a modern military bomber. Such forgings are today made possible by the use of the largest die forging press in America (18,000 tons). For hammer or press die forgings of aluminum, magnesium or steel, Wyman-Gordon engineers are ready to serve you—there is no substitute for Wyman-Gordon experience.

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NEWS DIGEST

DOMESTIC

Dr. Jerome Clark Hunsaker, for ten years chairman of the National Advisory Committee for Aeronautics, will receive the 1951 Wright Brothers Memorial Trophy at the Aero Club of Washington's annual Wright Dinner, Dec. 17, on the 48th anniversary of the first Wright flight. The award is for "significant public service of enduring value to aviation." Dr. Hunsaker is on the Board of Directors of the McGraw-Hill Publishing Co. and was an editorial consultant to AVIATION WEEK during its first months of publication.

John T. Mascuch, 52, president of the Breeze Corp., Newark, N. J., died Oct. 26 in Johns Hopkins Hospital, Baltimore. Mascuch founded the firm in 1926 and had been its president for ten years.

Scheduled airlines have been granted CAB permission to continue low-fare coach services for an additional 90 days beyond Dec. 31, date existing permits run out. The extension will permit CAB to complete survey for the purpose of forming a long-term policy on air coach.

Donald Nyrop, chairman of the Civil Aeronautics Board has been named chairman of the Inter-Agency Air Coordinating Committee. He succeeds Commerce Undersecretary Delos Rentzel in the post.

National Air Council's annual awards for outstanding aviation research and development were presented to Capt. Walter S. Diehl, formerly with BuAer, and Maj. John P. Stapp, USAF. Diehl was cited for contributions in the field of transonic flight; Stapp for his studies of deceleration's effect on human beings.

Personal and executive plane shipments, one-to-ten place, during September, came to 180 planes of seven firms with a total dollar value of $2,627,000 net billing price. There were 120 four-place or more, 59 two-place, and 1 single-seater.

Harmon International Trophy for the outstanding aviation feat of 1950 was presented to Col. David C. Schilling, USAF, for the first nonstop jet flight across the Atlantic, in a Republic F-84.

Warehoused aircraft quality steels will be earmarked exclusively for aircraft, guided missile and atomic energy programs after Jan. 1 by order of National Production Authority. After that date, all orders for these metals must be certified under Schedule 1 to NPA Order M6A to insure their use in such programs.

Major B-47 modification contract has been awarded Grand Central Aircraft Co., Glendale, Calif., by USAF. Features and equipment developed after the Stratojets have left the production line will be added by Grand Central. Some of the planes will be modified as cargo carriers, said C. C. Moseley, board chairman, although USAF and Boeing deny such a modification.

FINANCIAL

Chicago & Southern Air Lines has declared a 40-cent dividend on its common stock, payable Dec. 3, to holders of record on Nov. 20, making a total of 65 cents per share paid this year.

Republic Aviation Corp. reports a net income of $2,141,407 for the nine months ended Sept. 30, after provisions for taxes. Sales for the period were $83,077,697. As of Sept. 30, Republic's backlog was over $550 million.

Pioneer Air Lines net income after income taxes for the first nine months of 1951 was $1,439,252 out of revenue of $29,237,062. Net income in the third quarter was $768,238 after taxes.

American Airlines reports net income of $9,621,290 or $1.33 a share for the nine months ended Sept. 30, compared with $6,010,811 or 77 cents a share a year ago. This is after federal income tax of $15,760,000 including $2,415,000 excess profits tax.

INTERNATIONAL

Canadian Government contracts for aircraft spares, repairs and hangar repairs for the RCAF during Aug. 16-Sept. 15 totaled $1,449,165.

Air Chief Marshal Sir Alec Coryton, head of guided missile development for the British Ministry of Supply, will join the Bristol Aeroplane Co., Ltd., soon as managing director of the engine division.

IATA Clearing House transactions from January through August, 1951, totaled $105,014,000 as compared with $91,365,000 for the same period last year. August clearances were $14,942,000. Of the eight-month total this year 86% was settled through offsetting credit and debit balances.

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

500 LB.-IN. POCKET-SIZED ANGLgear

Photographed beside shotgun shells to show size and compact design

The Model R-300-X high ultimate strength ANGLgear is now available to withstand static loads up to 500 lb.-in. For applications where the standard model R-300 with 250 lb.-in. rating is marginal, the R-300-X is the answer. It is especially suited for manual operation of remotely located valves or controls which may develop high break-away torques.

Both the R-300 and the R-300-X are rated for transmission of 1/3 hp at 1,800 rpm. All models are lubricated for life and made with hardened gears, antifriction bearings, three-bolt side and flanged end-mountings with internal pilots.

See IAS Aeronautical Catalog for Dimensions

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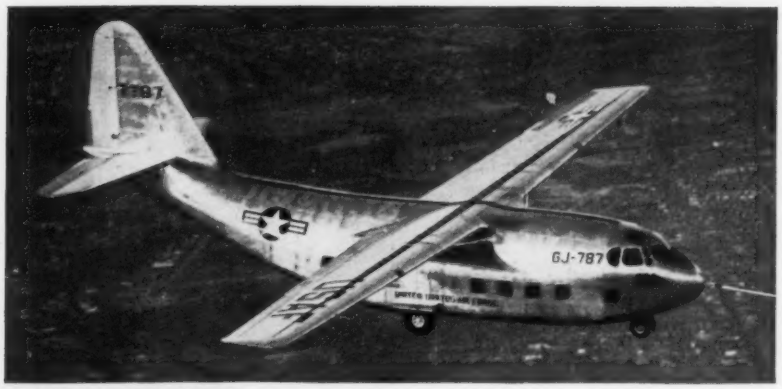

IT'S A GLIDER . . .

. . . IT'S A PISTON PLANE . . .

. . . IT'S A JET PLANE

". . . THE FIRST AIRCRAFT IN THE WORLD TO HAVE FLOWN PISTON POWERED, JET POWERED, OR AS A GLIDER . . ." (AVIATION WEEK MAGAZINE APRIL 30, 1951)

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AVIATION CALENDAR

Nov. 6-9—Symposium on the Physics and Medicine of the Upper Atmosphere, sponsored by AF School of Aviation Medicine and the Lovelace Foundation for Medical Education and Research, Plaza Hotel, San Antonio, Texas.

Nov. 7—Annual Wings Club Dinner, Waldorf-Astoria, New York.

Nov. 8-9—Seventh annual national conference on industrial hydraulics, sponsored by the graduate school of Illinois School of Technology and Armour Research Foundation, Sherman Hotel, Chicago.

Nov. 15-16—Seventh annual meeting of The Magnesium Assn., Biltmore Hotel, New York.

Nov. 16—Annual business meeting of the American Rocket Society, 29 W. 39 St., N. Y. 18, N. Y.

Nov. 27-30—Aviation Distributors and Manufacturers Assn. meeting, Waldorf-Astoria Hotel, New York.

Nov. 28-30—National convention of the American Rocket Society, Atlantic City, N. J.

Nov. 30-Dec. 5—Meeting of the American Society of Mechanical Engineers, Chalfonte Haddon Hall, Atlantic City, N. J. For information write: Ernest Hartfort, 49 W. 39 St., N. Y. 18, N. Y.

Dec. 4-5—Transport aircraft hydraulic accessory and system conference, sponsored by Vickers Incorporated, Hotel Sheraton, Detroit.

Dec. 6-7—Feedback Controls System, Chalfonte Haddon Hall, Atlantic City, N. J.

Dec. 15—Wright Brothers Lecture, U. S. Chamber of Commerce Auditorium, Washington, D. C.

Jan. 5-6, 1952—Annual Miami Air Show, sponsored by the Florida Air Pilots Assn., Opa Locha Airport, Florida.

Jan. 28-Feb. 1—20th Annual Meeting, Institute of Aeronautical Sciences, Astor Hotel, New York.

Jan. 29-31—114th National Meeting of the American Meteorological Society, Roosevelt Hotel, New York.

March 3-6—Institute of Radio Engineers, Waldorf-Astoria Hotel & Grand Central Palace, New York.

March 17-19—Second Midwestern Conference on Fluid Mechanics, to be held at Ohio State University.

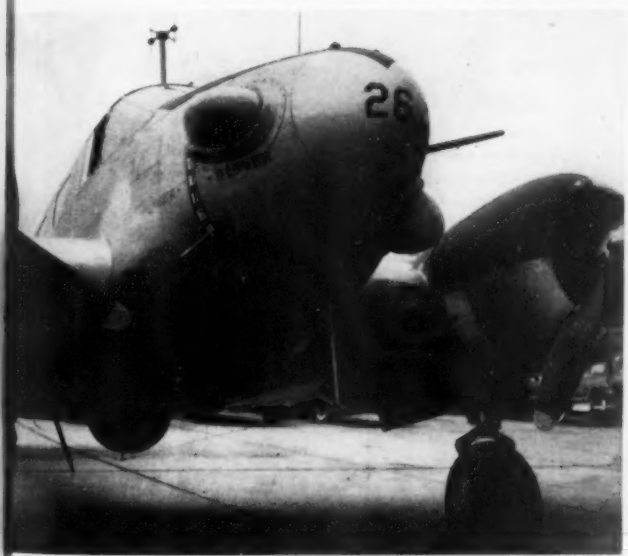
March 17-22—American Society of Tool Engineers, International Amphitheater, Chicago, Ill.

PICTURE CREDITS

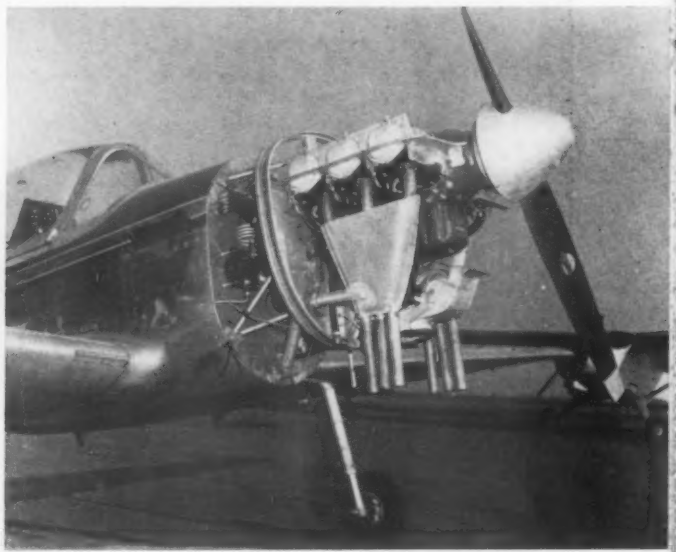
9—(Beech) Levy-Shipp; (Chipmunk, Avro CF-100) Warren Shipp; 15—Howard Levy; 17—Rotorcraft; 18—(Sikorsky) United Aircraft Corp.; (Lockheed) Lockheed; (Fairchild) Fairchild; 41—USN; 66-67—Randazzo & Morrison; 75—William Eccles.

ANTI-SUB CLASSROOM—Percival Sea Prince T. Mk. 1 (two 550-hp. Alvis Leonides engines) is used to train Royal Navy aircrews in anti-sub warfare, carries over a ton of special equipment. It differs from civil Prince in having longer nose, twin-wheel landing gear.

Plane Pictures in the News

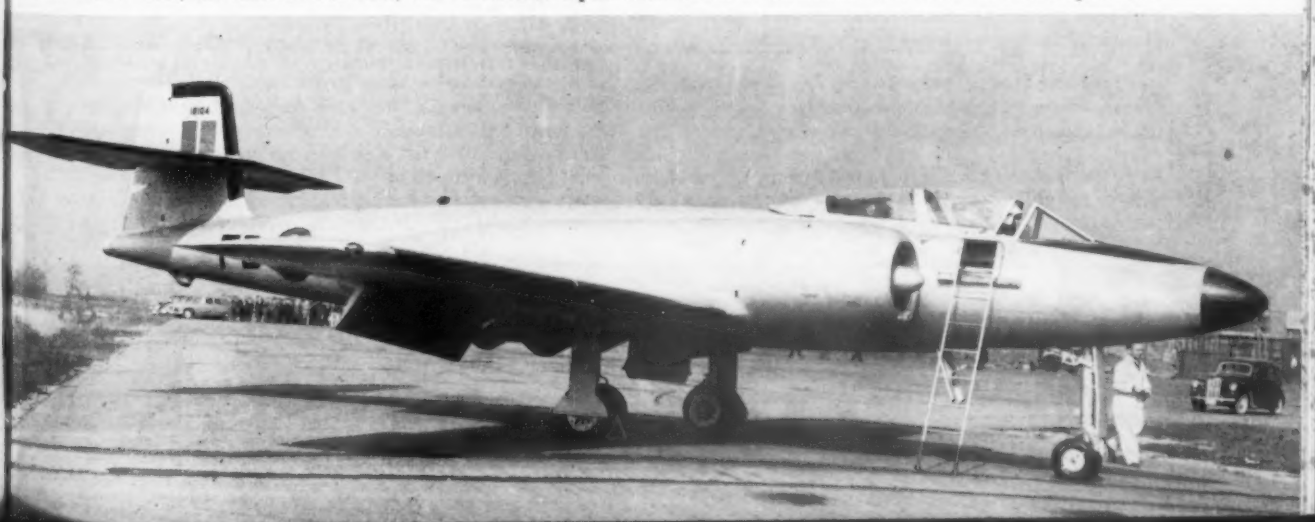


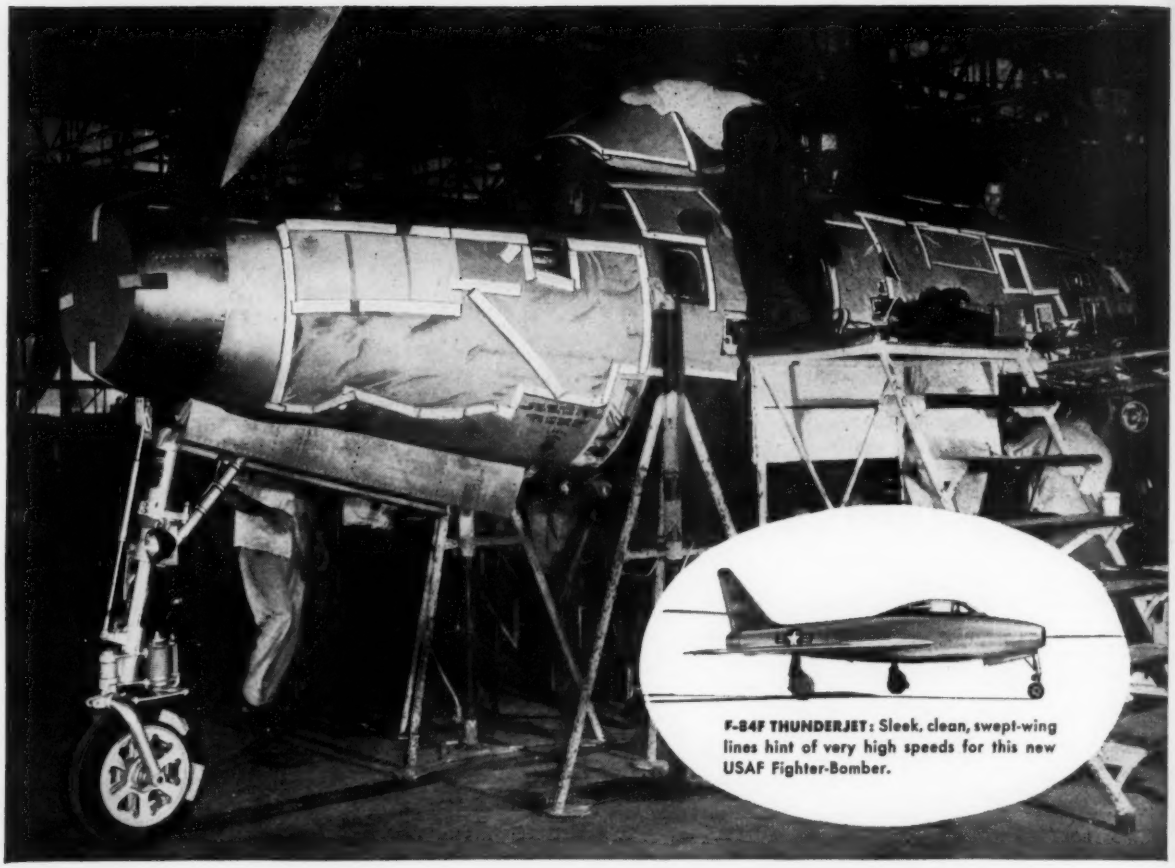
ANTI-RADAR CLASSROOM—Beech SNB-3Q's assortment of bulges around nose under fuselage house radar countermeasure devices used in training crewmen.



CHIPMUNK AMERICANIZED—Experimental Chipmunk trainer being tested by de Havilland, Toronto, has Met-L-Prop, a Lycoming O-435 in place of DH Gipsy engine. Note long exhaust stacks.

FIRST CANUCK JOINS RCAF—First Avro Canada CF-100 two-seat all-weather fighter (2 Avro Orendas) delivered to RCAF is seen below. This, the third CF-100 built, will be based at experimental station at Rockcliffe. It is fitted for Arctic operations.





Yesterday, the **Thunderbolt** *–Today, the* **Thunderjet!**

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Here are a few important jobs **PERMACEL** and **TEXCEL** Tapes perform to boost Republic's fighter plane production:

PROTECTING: PERMACEL 77 Masking Tape and 750 Masking Paper protect Thunderjet fuselages, wings, and rudders from minute scratches affecting speed flight.

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PERMACEL

WHO'S WHERE

In the Front Office

T. A. Bedford has been appointed vice president-manufacturing of Kaiser-Frazer Corp., in charge of automotive and defease production at Willow Run, Detroit and Dowagiac, Mich., and Oakland and Richmond, Calif. Bedford joined K-F in 1946, during World War II was assistant general manager of Kaiser Richmond shipyards.

Rear Adm. **James D. Barner**, USN, ret., has been named a vice president and elected to the board of Gyrodyne Co. of America. He will be the company's representative in Washington, D. C. During World War II he was a carrier commander.

Loren A. Murphy has been designated to the vice president-general manager of Goodyear Aircraft Corp., in charge of personnel and purchasing. Murphy, with Goodyear since 1925, headed all purchasing and subcontracting in GAC during last war.

Thomas K. Taylor has been promoted to vice president from assistant vice president by TWA. He is the line's liaison man with various government offices.

Changes

Leroy E. Bowery, chief of plant protection at Beech Aircraft since 1941, has been made manager of the company's Liberal, Kan., division.

Jasper F. Buret has been promoted to divisional superintendent in charge of factory operations at Glenn L. Martin's Plant 2.

Dr. Gerhard J. Sissingh, German aerodynamicist, formerly with Britain's Royal Aircraft Establishment's helicopter section, has joined Kellett Aircraft Corp.

W. S. (Stan) Saville has been appointed manager of Narmco, Inc.'s Aircraft division. Company is at Costa Mesa and San Diego, Calif.

A. G. Handschumacher, vice president of Lear, Inc., has been designated general manager of the company's Grand Rapids, Mich., division. **W. Dawkins Espy**, also a vice president, has been named chief engineer for the Grand Rapids division, succeeding **C. E. Willis** who resigned recently. **George K. Otis** has been made general manager of LearCal division, Los Angeles; **A. H. Endelkofer** replaced **James Wood** as works manager of the Grand Rapids plant; and **A. N. Lawrence** has been put in charge of that division's contract division, succeeding **leMoyne Dabbs**, now manager of Lear's eastern division office at Teterboro, N. J. **Richard H. Stewart** has been named quality control manager for the firm.

What They're Doing

Frederick W. Gill and **Frederic P. Kimball** have joined to handle aviation and management consulting under firm name of Kimball & Gill, with research offices at 400 Benedict Ave., Tarrytown, N. Y. (phone Tarrytown 4-4444). Gill directed the Harvard School of Business report, Airline Competition, and Kimball has been active as an independent air transport economist.

INDUSTRY OBSERVER

► Newest proposal to Air Force for a super-sized heavy cargo transport calls for a sweptwing version of the Convair C-99, with 100,000-lb. payload. It is basically a transport counterpart of the sweptwing eight-jet B-60 heavy bomber proposal. Alternate eight-engine turboprop and turbojet versions are proposed.

► **Key to the increased requirements for GE-J-47 engines in USAF fighters and bombers, is the opening of a General Electric Co. service shop at Strother Field, Kan., for overhaul and modification of J-47s, in addition to the similar mod shop already in operation for North American F-86 powerplants at Los Angeles. The Strother Field shop will handle engine shipments from Ft. Worth (B-36s), Oklahoma City (Tinker USAF Jet Overhaul Depot) and Tulsa and Wichita (B-47s).**

► NACA's aircraft icing researchers recently have conducted tests with "super-cooled" water measuring the surface tension of the triple-distilled water at temperatures as low as −22.2C.

► **Technical difficulties in development are pushing back the missile-carrying 1954 interceptor program at Republic and Convair, so actually it will probably be closer to a 1956 interceptor.**

► North American's sweptwing proposal for additional production on the four-jet B-45 Tornado bomber is attracting considerable Air Force interest, but Air Force is also studying the new Navy Douglas A3D carrier bomber for essentially the same use. One or the other is likely to be tapped for a production order.

► **Hamilton Standard has offered two turboprop propellers for evaluation on the forthcoming Convair T-29 navigation trainer and Curtiss Propeller division also is likely to submit test designs, signalling the end to a virtual "exclusive" which Aeroproducts division, General Motors Corp., has held on props for Allison T-38 engines. Meanwhile Aeroproducts still is interested in getting some of its propellers tested on the new Pratt & Whitney T-34 turboprop engine, which thus far has remained a Hamilton Standard "exclusive."**

► Pacific Airmotive Corp. maintenance service program for experimental high-speed aircraft at Edwards AFB, Muroc, one of the most unusual commercial fixed-base operation in the country, has provided servicing on such odd craft as the McDonnell XF-85 parasite fighter and the Bell X-5 variable-sweep research plane as well as McDonnell's XF-88 Voodoo fighter and Republic's XF-92 and XF-96 jets. PAC provides mechanics and engineering specialists, and materials, from its nearby Burbank headquarters.

► **Beech Aircraft Corp. reported deliveries of 23 Twin-Beechcraft planes to Canada, as of Sept. 30.**

► Navy is installing a new safety device on jato mechanisms after a near accident in a jato takeoff of the Caroline Mars from the Honolulu waterfront last month. Sixteen red-hot jato bottles weighing 70 lb. apiece were accidentally dropped prematurely in a salvo which came precariously close to sinking several fishing vessels and setting some fires ashore, but did little if any actual damage. The new safety arrangement will prevent a repetition of such an incident, a Navy spokesman said.

► **North American's new F-86H jet fighter to be built at Los Angeles is designed for ground support and low level attacking operations.**

► USAF and Navy planes have flown more than 350,000 sorties since the start of the Korean war, June 26, 1950. Official Defense Dept. tally as of Sept. 30, 1951, claims for AF: 223 kills, 84 probables, and 235 damaged enemy aircraft; for Navy-Marines: 80 kills. USAF totals include 99 MiG kills, 35 probables and 183 damaged.

Washington Roundup

'Atomizing' the Armed Services

Large-scale utilization of "dozens of varieties" of atomic weapons by the armed services is three years off, although they are being discussed as available "soon."

It will take that long to construct the facilities for mass production. The cost: about $6 billion a year, or approximately $18 billion total. Only $1 billion a year now goes into the atomic program.

Congress' Joint Atomic Energy Committee is prodding the military to move forward all-out with the program. The group has directed the Department of Defense, in collaboration with Atomic Energy Commission, to submit by Jan. 3:

"A definite and concrete report on maximizing the role which atomic energy can and should play in the defense."

The big question: Will an "atomized" defense establishment cost more or less?

Atomic Energy Committee's chairman, Sen. Brien McMahon, reaches the happy conclusion it will cut the defense bill by some $30 to $40 billion a year, after the basic investment is productive capacity during the next few years.

He claims that instead of the present prospect of a $60-to-$80-billion-a-year defense outlay over the coming years, the U.S. could have increased striking force for some $30 to $40 billion a year "with an atomic Army, atomic Navy, and an atomic Air Force."

But military men don't agree.

• **McMahon argues:** The U. S. now spends $4 billion a year for conventional firepower, from small arms to bombs. If this amount were channeled into atomic weapons, the striking power would be multiplied many times and the size of the services—in manpower, fleets of ships and aircraft—could be minimized.

• **Military men,** though, point out that military size is determined by missions.

One USAF spokesman comments: "a pilot and one plane with a super A-bomb could have brought more 'firepower' to bear against the enemy in Korea than all the ammunition and bombs we've used over there added together; but this strategy would not have effectively deterred the enemy and driven back his lines."

On one point the military are emphatic: Increased firepower from atomic weapons will not reduce the need for aircraft "an iota."

They do agree with McMahon that atomic arms would shorten a war, but they fear that an $18-to-$20-billion outlay for atomic facilities will mean cuts in funds and will draw on materials and technical personnel needed for planes and other end-items to increase military strength now—not five years from now.

Airmail Separation

The airlines argued against the "arbitrary" setting of mail rates as proposed by the Johnson bill, and said rates should be determined by CAB after consideration of individual operating factors.

But six large regional carriers and ten local lines would fare far better under the rates proposed in the Johnson separation bill, recently passed by the Senate and now awaiting House action, than under the rates fixed by CAB without consideration to individual factors:

• **Regional carriers,** down for only 53 cents a ton mile by CAB, would get a 60-cent rate. They are: Braniff, Capital, Chicago & Southern, Delta, National and Western.

• **Local lines,** allowed $1.48 a ton mile by the Board, would get $1.80. They are: All-American, Bonanza, Empire, Frontier, Trans-Texas, West Coast, Wisconsin-Central, Lake Central, Ozark, Southern.

But some of the locals would not make out as well under the Johnson bill, which allows them $1.80 a ton mile, as under the CAB decision. The Board allowed Central $2.58, and Mid-West and Wiggins $7.26.

CAB rates for other carriers approximate the proposals of the Johnson bill.

Ceiling on Generals

Although USAF is now the major service dollar-wise, Senate Armed Services Committee has set a ceiling of 333 on the number of USAF generals, while allowing Army 496. The ceiling on admirals is 280.

USAF now has 316 general officers; Army, 493 and Navy, 266 admirals.

At peak of World War II, AAF had 320 generals; the Navy 563 admirals and the Army 1,200 generals.

Here and There

► **International Carriers**—Sen. Pat McCarran will try for action early next year on legislation authorizing payment of construction differential subsidies to international carriers. He introduced a new version of the measure before Congress adjourned. Its backer in the industry: Pan American Airways. U.S. manufacturers claim that because of greater technological efficiency their plane costs are actually less, not more, than the foreign competition—despite foreign companies' lower wage costs.

► **Renegotiation**—With a $1-million appropriation, the new Independent Renegotiation Board, headed by former Assistant Secretary of Navy John Koehler, is ready for business. It will take over the operational as well as policy aspects of renegotiation. One of the major questions for the Board: what contracts are to be subject to renegotiation?

The law gives wide latitude, providing that not only military contracts, but contracts relating to the defense program be open to reconsideration.

► **Wright Patterson Investigation**—Investigators have been at the procurement center for "some time." Sen. Lyndon Johnson's Preparedness Committee expects to make a report on procurement practices and "other aspects" around the beginning of the year.

► **Aircraft Profits**—A comparative study by Sen. Johnson's group, of profits in leading industries over the past ten years, based on sales and investment, is about half completed.

► **Support for Nonskeds**—Sens. Wayne Morse and Dennis Chavez have joined Sen. John Sparkman's congressional drive for the nonskeds. The staff of the Senate Small Business Committee, which Sparkman heads, will keep an eye on CAB actions on nonskeds during the recess.

Chavez put the Board on notice: "Now that Congress is adjourning, what indication is there that the next few months will not see continuation of this process of 'strangulation by regulation?' If, during the intervening months, another nonsked independent is put out of business, I think this would be an act of bad faith on the part of CAB toward the Congress."

—Katherine Johnsen

AVIATION WEEK VOL. 55, NO. 19
NOVEMBER 5, 1951

Swiss Arms Firm Invades U.S. Market

- **American subsidiary of Oerlikon, headed by Lt. Gen. K. B. Wolfe, eyes explosives and missiles first.**
- **But manufacture of machine tools, electronics, and especially aircraft armament, is planned.**
- **It adds up to an integrated research, development and production company along European lines.**

By Ben S. Lee

U. S. aircraft and munitions industries are faced with a new kind of competition by a Swiss firm steeped in the Old World tradition of giant arms combines selling impartially to governments in peace and war throughout the world.

Oerlikon Tool and Arms Corp. of America, subsidiary of the Swiss Armament Complex, shortly will announce plans for construction of a major explosive powder facility in the U. S. which also will serve the dual role of final assembly point for various missile weapons.

Headed by retired Lt. Gen. K. B. Wolfe, former USAF deputy chief of staff for materiel, the American firm will establish an integrated armament research, development and manufacturing firm designed to give the U. S. an arms industry on a par with such European firms as Skoda, Krupp, Bofors, and Hispano-Suiza.

The company also will introduce a complete line of commercial items, including machine tools, electric and electronic equipment such as calculators and other business machines. Most of its commercial items, with the exception of machine tools, likely will be held "on the future shelf" during the defense expansion.

▶**Foreign Designs**—Oerlikon-America eventually will produce U. S.-researched armament, according to Wolfe, but during the initial build-up probably will manufacture a considerable number of weapons under Swiss license. Much in the same manner, Wolfe said, as Pratt & Whitney is producing the British Nene (J-42) and Tay (J-48) jet engines under license.

This nation, Wolfe declared, in past major military operations has used many armament items of foreign design and origin. During World War II, he said, some 300,000 Oerlikon 20mm. anti-aircraft guns were built for use by the United States and for its allies.

This was in addition to a considerable quantity of Bofors and Hispano-Suiza guns similarly manufactured in the U. S.

The United States in early World War II began development of aircraft armament systems—turrets, computers, gunsights, etc. These developments were the responsibility of the Bureau of Aeronautics and the Air Corps of the U. S. Army. Guns and ammunition for the flying services, on the other hand, were the responsibility of the Bureau of Ordnance, Navy, and the Chief of Ordnance, Army.

▶**Family of Arms**—This development is still largely sponsored by the military and not by industry.

Early in 1946, E. G. Buhrle, president of Oerlikon-Switzerland, decided the company would develop a family of aircraft rockets, guided missiles, aircraft guns and fire control equipment.

This was done entirely with company funds drawn from profits of commercial items as well as from armament sale. (Example: the guided missile recently shown at a Zurich fair and reported in Aviation Week Sept. 17, p. 18.)

In contrast to American industry's dependence upon irregular government appropriations which control development and expansion of armament research and manufacture, Oerlikon relies upon commercial endeavors to support its prime field of arms development, in peace years, Wolfe said.

A considerable but undisclosed capital investment in the United States already is projected by Oerlikon to establish the American company. The integrated armament complex planned by Oerlikon requires extensive manufacturing and test facilities, powder plants, firing ranges, laboratories, etc.

▶**To Train Personnel**—Because Oerlikon is late in getting into U. S. defense production program, it will concentrate temporarily upon final assembly of armament from subcontractors. So far it has completed tentative arrangements with seven U. S. subcontractors for manufacture of component parts of weapons for the military service.

Production technique during initial plant expansion will be guided by Swiss experts who will train American personnel in Oerlikon research and manufacture methods.

Eventually the American company will be controlled and operated completely by U. S. personnel.

Oerlikon projects early production of a family of machineguns designed solely for aircraft use. Heretofore U. S. aircraft machine guns have been adaptations of ground types modified for aircraft use. But increasingly high speeds of present day military planes are proving these weapons inadequate.

▶**Tool Shortages**—Oerlikon, according to Wolfe, will be identified in the United States primarily as a designer and manufacturer of aircraft armament, since its Swiss counterpart has been previously internationally known for its medium caliber weapons for ground and

This Is Oerlikon of Switzerland

● **Sheltered behind the unwieldy name of "Oerlikon Machine and Tool Works, Buehrle & Co." and a world-wide reputation as a manufacturer of machine tools, the Oerlikon establishment of Zurich, Switzerland, is better known in the war ministries of the world as a purveyor of fine armament . . . Net worth, $3.5 million, small by U. S. standards, but large in a small country . . . Founded in 1883 at Oerlikon, Switzerland, a Zurich suburb later incorporated into Zurich . . . Began as group of small manufacturing companies, brought together in 1924 by E. G. Buerhle into Oerlikon Tool and Arms Corp . . . Has several companies in Switzerland, Italy and India, and ties with machine tool manufacturers in Germany . . . Manufactures 40 different products.**

naval use. There are no plans, he said, for the company to engage in heavy armament development or manufacture.

Because of the shortage of machine tools in the United States, Wolfe said, there is some consideration being given at the present time to speeding up planned manufacture of the Oerlikon machine tool line.

Reluctance to begin at this time, he explained, is due to shortage of trained personnel in this field.

Personnel shortage in this field of manufacture is of course international, he said. Example: the entire machine tool manufacturing capacity of foreign manufacturers has been bought up for the next two years.

▶ **Three Directors**—Oerlikon-America is incorporated under Delaware law and at present has a directorship of three, including Wolfe as president, Frederic Chapuisat, secretary and treasurer, and Leslie A. Skinner as vice president-engineering. Skinner, West Point graduate and a retired colonel, is best known in the weapons field for his development of the wartime famous "Bazooka" rocket gun. Wolfe has offices at the Duryea Building, Washington, D. C.

Company will eventually have a total American directorship of seven, Wolfe said, and although it currently is financed by its Swiss counterpart, it is planned to invite American capital to participate later.

Other members of the American company are Phil Neikum, director of production, W. E. Tizzard, assistant to the president, Clarence A. Davenport, demonstrator and test engineer and Robert C. Sellers, assistant secretary and treasurer.

Jury Indicts Two In AMC Deals

Dayton—Federal grand jury indictments returned here recently indicate that Air Force contractors involved in procurement irregularities may face prosecution as well as contract cancelation.

A former contractor and a Procurement division buyer were named on five counts each, which may set a pattern for future treatment of similar cases. Indicted:

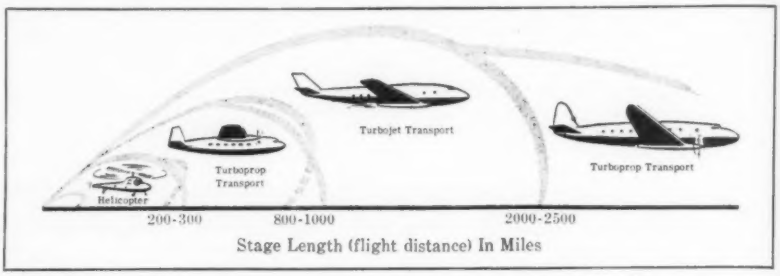
- **Lawrence A. Rozete,** head of Cincinnati Electronics, Inc. and Raytronics Lab, Inc., both in Cincinnati.
- **Luther M. Kratz,** Eau Claire, Wis., former electronics buyer at Air Materiel Command.

Four of the counts involve getting and receiving of gifts, and the fifth charges conspiracy to violate a U. S. Code provision dealing with fraud in connection with material to be used in aid to foreign government programs.

Ray O'Donnell, U. S. attorney for the Southern Ohio district, had "no comment" when asked if additional indictments might be expected.

Air Force officials had no statement to make, but pointed out that details on all irregularities have been referred to the Department of Justice for action. It previously was announced that several contracts had been canceled. Identities of contractors were withheld, however, until the grand jury indicted Rozete.

The indictment indicate that Kratz received $1,400 cash and a radio from Rozete in connection with a series of contracts he awarded to Rozete's companies. The contracts were for radio sets.



DISTANCE USES of future types of transport aircraft as predicted by Europeans.

U.S. Checks Up on Jet Airlines

Survey shows foreign development 'excellent' but looks to home producers for better models.

Is the British de Havilland jet Comet transport more economical than the Douglas DC-6? A United Air Lines study reportedly indicates it may be for some flights.

Is the Comet more economical than the Lockheed 749A Constellation on flight stages over 900 miles? KLM Royal Dutch Airlines says it would be for them.

Will Bristol Britannia turboprop transports be whisking passengers across the Atlantic 100 knots faster than first-line U. S. competition? British Overseas Airways says the Britannia will cruise 100 knots faster than the Boeing Stratocruiser.

▶ **Report Details**—These are some of the questions worrying American aircraft manufacturers and international airlines.

The most comprehensive set of answers to such questions on turbine-powered plane development, operations and economics to date is in the 110-page CAA report "Foreign Civil Transport Aircraft Development Progress," released today.

It is the work of the six-man foreign survey group of the CAA Pototype Aircraft Advisory Committee, chairmanned by Harold D. Hoekstra, top CAA aircraft engineer. The other five members who conducted the foreign survey and wrote this report and its unanimous conclusions are: Col. Ted E. Enter of the Defense Department; Kenneth C. Gordon, Boeing Airplane Co.; Otto E. Kirchner, American Airlines; Capt. W. W. Moss, Jr., Pan American pilot representing the Air Line Pilots Assn.; and Raymond E. Small of General Electric Co.

Here are some highlights of their detailed report:

- **500-hours overhaul on jet** engines of the Comet is expected although they are overhauling the Ghost engine at 250 hours now in the break-in period of Comet development.
- **U. S. leads in aerodynamic** development, says the survey group. "Foreign manufacturers have done an excellent job of designing within the limits of their aerodynamic research and development data. However, some of their newest aircraft appear vulnerable from a competitive standpoint. . . " The group says "it should be possible (for Americans) to produce new models which will have marked performance advantages over any of the foreign aircraft now in actual production."
- **U. S., British turbines are equal** in development stage, "with U. S. ahead in the technique of quantity manufacture," the group finds.
- **Centrifugal type turbine** simplicity may dictate its use for short-haul commercial transport, the group says.
- **Axial-flow turbine** efficiency potential may dictate its use on long-haul transport.
- **Takeoff power increase** will be derived from water-alcohol injection rather than afterburner for turbine power transports, the British believe.
- **Turboprop engine failures** will be less frequent than piston engine failures, Armstrong-Siddeley believes. But experience is still insufficient to be sure of failure-rate expectations.

• **Fire protection** will be better than on reciprocating engine planes, it is believed, assuming fuel can be cut off easily and quickly.

▶**Boeing May Be First**—Boeing is expected by some observers to put the most effort into selling the first U.S.—built commercial jet transport. Reasons: Boeing has the most jet bomber experience; Boeing's chief transport competitors are already selling conventional transports for turboprop conversions.

Here is the Boeing approach to designing a jet transport, as placed in the report by Kenneth Gordon of Boeing. These recent Boeing specs agree closely with their two-year-old design proposal for a Boeing 473 jet transport, pictured and described in detail in AVIATION WEEK (June 18, p. 19).

1. 600 mph. at 40,000 ft. altitude; 2. normal cruise altitude maintained if one engine out; 3. takeoff runway no problem, a landing distance more critical; probable Boeing criteria are 6,000-ft. for domestic and 7-8,000-ft. landing runway for long-range over-ocean operation; 4. fin area designed to meet cross-wind landing needs; then engines possibly moved outboard for best structural and balance character; 5. sweptwings, with engines mounted forward of leading edge—both to help reduce gust loads; 6. cabin pressurization taken direct from engine compressor section; 7. 16,000-lb. payload, 2,000-mile range with reserve, and fuel consumption of 12 lb. per mile; and 8. takeoff weight of 135,000 lb.

Boeing estimates prototype development of such a plane would require four to five years. Starting production before finishing prototype development cost Boeing a $25-million loss in its Stratocruiser program, company says.

▶**The de Havilland Corp.**—The de Havilland Corp. has facilities to turn out from 60 to 120 Comets a year, if American or other orders are forthcoming, says the most recent airline executive returned from a visit at the de Havilland plant and a flight in the Comet. He says the plane mile cost of the Comet during break-in period will about equal the Stratocruiser, Constellation or the DC-6. "But," he says, "I believe the airplane-mile cost eventually will be considerably less than for these three aircraft, as the overhaul cost of engines . . . will decrease and other direct costs should be slightly less."

Seating capacity is a limiting economic factor on the plane, this observer reports, with standard seating of 35-44 passengers. He reports this probably can be increased to about 50 passengers. "The aircraft would work beautifully between New York and Los Angeles with a stop at Tulsa," he says, and "probably it would make the run in 6½ to 8 hours, including a fuel stop of one hour at Tulsa."

Panels Meeting On Labor Issues

Hearings started last week on issues behind the strikes at Douglas Aircraft Co., Long Beach plant, and Wright Aeronautical Corp., at Wood-Ridge and Garfield, N. J. Meanwhile both plants had employes back at work pending settlement.

Wage Stabilization Board, to which President Truman certified the disputes for recommendations Oct. 12, set up two outside panels to hear the contentions of the companies and locals of the United Auto Workers-CIO. Strikes of five weeks at Douglas and three weeks at Wright were ended at the request of WSB.

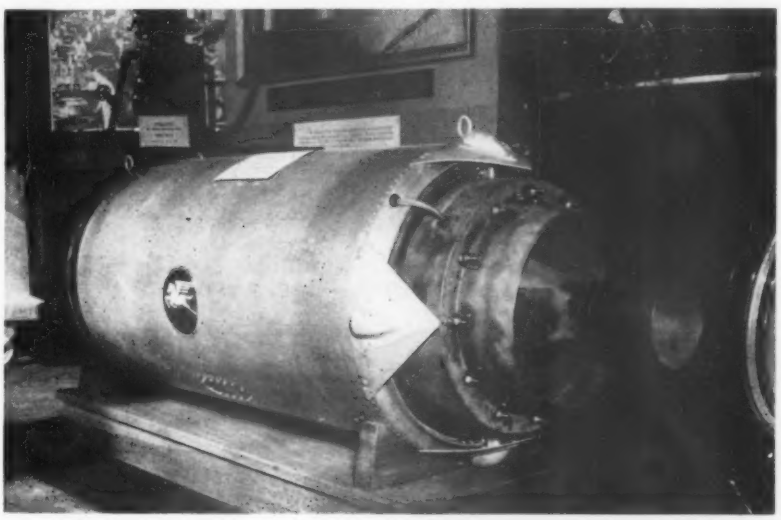
• **The Douglas Panel** convened at Los Angeles on Oct. 29 with Ralph Seward as chairman and Edgar L. Warren as another public member. Representing industry on the panel are Robert H. Byron, Jr., vice president of Consolidated Vultee Aircraft Corp., San Diego, and Robert Ross Gurunsky, managing director of California Metal Trades Assn.

• **The Wright Panel** met Oct. 31 in Washington, with Harry Shulman, Yale law professor and impartial umpire at Ford, as chairman. Industry representatives are Samuel N. Angotti, secretary of Landis Tool Co., Waynesboro, Pa., and Douglas Black, labor relations director of Bendix Aviation Co., South Bend.

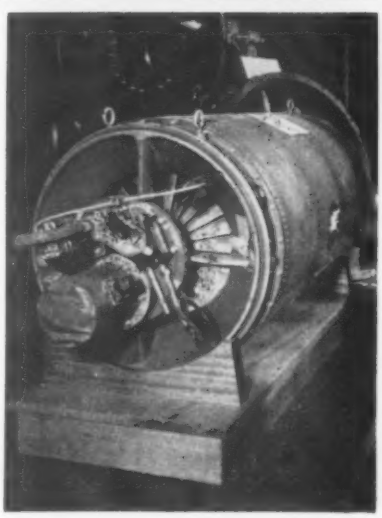
While neither Douglas nor Wright had direct representation on the panels, the UAW-CIO was represented on the Douglas panel by one of its international representatives, John Vincent, and on the Wright panel by the director of the union's general Motors Department, T. A. Johnstone.

The panels will hear all issues in dispute, not only wage questions.

Meanwhile, the government was sitting tight on WSB's request that UAW-CIO terminate its strike at ten Borg-Warner Corp. plants before it will consider the dispute. Workers have been on strike since Oct. 10.



Junior Jet



Fairchild engine division's new YJ-44 jet for USAF and Navy gives 1,000-lb. thrust, weighs 325 lb., with accessories. Length is 6 ft., diameter 22 in.

Design was begun more than three years ago, and qualification tests completed early in 1950. Unit's power rating and general configuration indicate it is expendable.

Behind the accessory section at front is the inlet to what obviously is an axial-flow compressor. Aft end is somewhat unconventional, with exhaust cone bullet flaring to form a highspeed nozzle in the exhaust path. Arrangement probably is a simple cooling scheme to handle ram air taken in through bullet strut scoops, then through struts, bullet, and out the nozzle.

What Tory Win Means to British Air Power

British aircraft design genius, typified by such new rising stars as the Hawker P.1067 sweptwing interceptor and the Vickers Valiant four-jet bomber, has always been bright. But British production, as Aviation Week has reported, suffers from shortages in labor, materials, housing, and—perhaps above all—money. Will a change in government solve these difficulties? Here, Nathaniel McKitterick, McGraw-Hill "World News" correspondent in London, gives a preliminary estimate of the election's effect on British air power.

London—Britain's aircraft manufacturers, along with virtually all of British business, cheered the return of a Tory government last week, and held high hopes that the industry stood to gain quickly from the results.

Unlike some British industries, the plane-makers have reason to expect a change in fortunes. The Tories, much more than the Laborites, are likely to do something about putting Britain's rearmament program back on schedule. The industry has been badly slowed down by labor shortages and indefinite production schedules.

▶**New Transports**—The Tories' chief air spokesman, Air Commodore Vere Harvey, who was recently named a director of Handley Page, has indicated he will continue his campaign to lessen Britain's air dependence on the U. S. One of Harvey's big battles has been for RAF's depleted transport command.

The RAF today hasn't got a plane capable of carrying heavy military equipment. The Labor government was holding out for Fairchild C-119s, or failing that, C-82s, from the U. S., under the arms aid program. Air Cdr. Harvey lost no opportunity in the last parliament to press for production of a British type. Now, chances are, orders will be placed.

Blackburn & General's GAL-60 freighter is likely to be the first choice. Bristol Aeroplane's Freighter, recently ordered by the RCAF, may also get a slice of the pie. A military jet transport, probably a modified Comet, is also in the design stage, but it is doubtful that Comet production will be diverted to this unless war becomes much more likely.

Air Cdr. Harvey was also a champion of a British strategic bomber arm about a year ago. With the development of four bomber prototypes, the Vickers Valiant, Short Bros. SA/4, and two others still under security wraps, this argument hasn't been pushed lately. But hardly more than 20 Valiants and no other new bombers have been ordered so far. The Tories may step up this program, too.

In the civil field, there has been a lot of pressure from Tory quarters to denationalize some of BEA's and BOAC's feederlines inside England and to the Continent. But little, if anything, is likely to be done about this for some time. The nationalized airlines are just beginning to settle down. Another intrusion from the politicians might reverse the trend and it isn't likely that the Tories will risk it. Besides, it might be many years before the present government could find time to tackle such a problem.

▶**Housing Problem**—Biggest boon to the industry will be a few strategically placed houses to attract sorely needed labor to aircraft plants. The Tories have pledged themselves to build 300,000 houses a year. The target is probably too high, but if the effort entails some easing of restrictions on where houses can be built, aircraft manufacturers should benefit. Many aircraft plants in England are in outlying areas with relatively low priorities for the always scare building materials.

Then, too, aircraft plant managers look for more definite plans from a Tory Ministry of Supply than they have been getting under labor. Letters of intent for some new planes—the Vickers Supermarine Swift for one—still haven't been fed out to the producers, even though the RAF snapped up the plane from drawing board designs.

▶**Money Problem**—The Tories will find spending money on airplanes more palatable than Labor did but faced with as tight a financial and materials squeeze as Britain has had since the war, the new government is still going to be in a straight-jacket.

Tory leaders, as well as Laborites, claim that they cannot finance even their present three-year, $13.1-billion rearmament program without more help from the U. S. The reason is simple: The pressure on any British government today to keep defense spending as low as possible is terrific; the leeway in the country's standard of living is nothing like that in the U. S.

Level Mileage Pay In UAL-Pilot Pact

United Air Lines and its pilots have signed a wage contract paying co-pilots up to $306 more a month, senior pilots up to $131 more, all retroactive to 14 months ago. This settlement comes after two years of bargaining and an 11-day strike in June.

It does not have any of the mileage determination features included in the airline-pilot contracts signed lately by Capital, TWA and others. UAL President W. A. Patterson is adamant against including that principle.

Under the new contract, UAL will pay an extra 1½ cents a mile on top of base pay, gross weight pay and hourly pay. UAL's straight 1½ cents a mile differs from the mileage formulas agreed to by most other airlines this year, which calls for a rising rate.

Under the new contract, first pilots can make up to a maximum of $1,051 on DC-3s or $1,512 a month on Stratocruisers compared with previous top possible pay of $912 on DC-3s and $1,381 on Stratocruisers. Co-pilot pay can go as high as $675 on DC-3s to $906 on Stratocruisers, compared with previous highs of $570 and $600.

The 14-month retroactive clause is equivalent to $100 a month back pay for every pilot for periods ranging from 10-12 months for captains to 21 months for co-pilots.

Contract also has fringe benefits like pay at half the flight time rate for deadheading.

United now has over 1,000 pilots flying about 170,000 miles a day with 10,000 passengers, 100,000 lb. mail and 236,000 lb. cargo.

AF Yields on Army Plane Weight

Procurement limits are listed; ground forces will press for increased numbers of heavier aircraft.

The hotly contested debate over weight limitations imposed on Army in its procurement of fixed and rotary-wing aircraft has been ended by agreement between USAF Secretary Thomas K. Finletter and Army Secretary Frank Pace, the Air Force has disclosed to AVIATION WEEK.

Restrictions barring Army from mass procurement of fixed-wing aircraft weighing more than 2,500 lb. and rotary-wing aircraft weighing more than 4,000 lb. are now canceled. These restrictions are covered in joint Army-Air Force regulations dated Mar. 25, 1950 and are numbered AFR 65-7 and AR 700-50.

Presently the agreement for cancelation is in memorandum form only. Precisely what types and how many and for what purposes Army may procure aircraft regardless of weight is now under study by both of the services.

▶**Specifically**—The Air Force and the Army stated: "Army and Air Force are in agreement that specific weight limitations on Army aircraft as outlined in existing regulations are no longer governing and that performance of functions is the paramount consideration.

"In view of this fact, Air Force is currently procuring liaison and helicopter aircraft for Army use, which are heavier than formerly procured. This action has been taken with the concurrence of civilian and military leaders of both department.

"A memorandum of understanding has been drawn up between Mr. Finletter and Mr. Pace and is now being used as a basis for staff agencies of both services to prepare the necessary revised joint regulations."

▶**Army Interests**—Both services are reluctant to interpret unofficially what the Finletter-Pace agreement means to Army air procurement until it is officially delineated by regulation. But Army probably still is to be prohibited from mass procurement of aircraft which would infringe upon USAF roles and missions.

That Army will press for increased numbers of heavier aircraft and for purposes hitherto restricted, however, is evident by its continued interest in light personnel and assault transports and heavy helicopters.

• **Light transport.** Army has already procured a number of Canadian de Havilland Beaver through a previous waiver of weight limitations and undoubtedly will order more. It has also been authorized a large share of the Beech Twin Bonanzas recently ordered by USAF for utility purposes and has made no secret of the fact that it would like to have a considerable number of the recently USAF ordered Beech T-36 multi-place transport trainers.

• **Assault transport.** Army has previously asked Air Force for reconsideration of USAF scheduling of production of only the medium Chase C-123 assault transport instead of programming production of both the medium and the C-122 light assault transport. Air Force had turned down Army proposals for procurement of both because of funds and utility of purpose of the C-122 with possible requirements of the Air Force.

So successful has the light assault transport proved, however, in tests by Army and Air Force that there is some new consideration being given to establishment of light fixed-wing assault companies along with Army's already established helicopter companies.

• **Helicopters.** Long an advocate of the helicopter in transport and liaison activities in combat, Army is sure to seek to increase its strength in virtually all weight classes of helicopters from Hiller to Hughes. It has long eyed Marine Corps development of helicopter assault transports for amphibious operations and is sure to press for heavier emphasis by Army and Air Force in this field in any of their future plans.

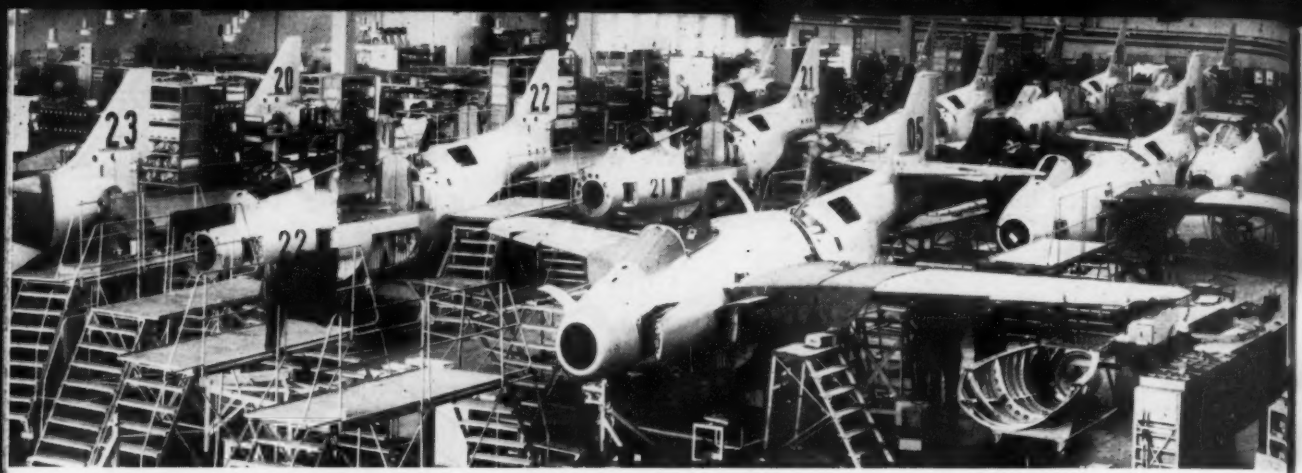
Battle for establishment of a "small" Army Air Corps to maintain services peculiar to Army needs began shortly after Air Force won autonomy in 1947. Army pointed to need for some air force of its own just as Navy found need of a Fleet Logistics Air Wing separate from the Air Force's Military Air Transport Service.

Temco Speeds C-54s

Temco gave Air Force delivery ten days ahead of time of the first C-54 to be overhauled in its entirety at the new Majors Field Overhaul Base, Greenville, Tex.

ROCKETCOPTER

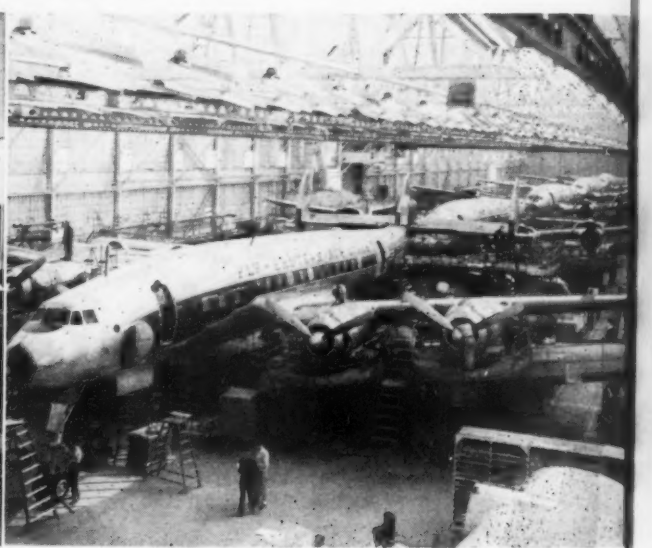
This unconventional project, developed for the Office of Naval Research by Rotor-Craft Corp., is a "knapsack" helicopter designed for dropping armed troops or agents behind enemy lines. Ground tests of the "pinwheel," as it is named by its maker, were begun recently at a military base in the Los Angeles area. The two small rotor blades are powered by tip-mounted liquid-fuel rockets which are said to be self-starting and throttle-controlled. These motors emit no flame during operation, says Rotor-Craft. The rotor is attached to a steel tube which also carries the fuel tanks, pilot's seat and a cargo hook. A small rudder is carried on another tube to the rotor head. The curved control column extends downward from the rotor head. The entire device weighs less than 100 lb. For quiet descent, pinwheel can use autorotation. Make of the tiny rocket motors has not been divulged. Performance of the motors would have to be sufficient to lift at least one-and-one half times the weight of the ingenious apparatus, with fuel consumption low enough to afford a reasonable combat range.



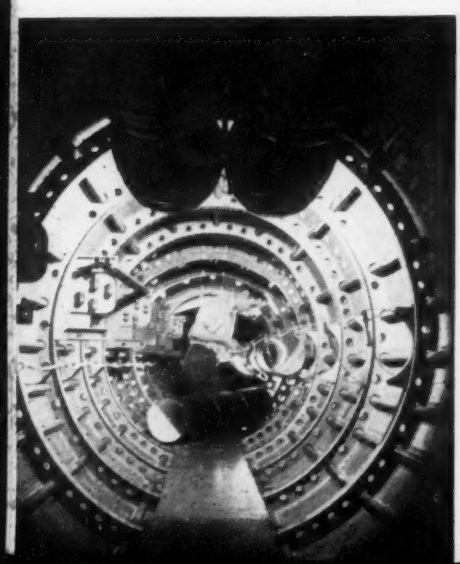
SAAB plant at Linkoping, Sweden, shown here busy turning out J-29 sweptwing fighters (Swedish-built DH Ghost engines), seems to make full use of available space.

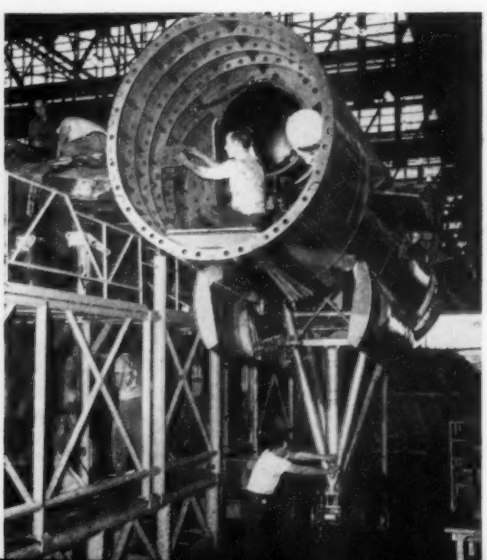
Down the Line—Here and Abroad

SIKORSKY S-55s for Navy, USAF, Marines take shape on the company's Bridgeport, Conn., line. Roomy fuselage makes it easier to handle interior.



LOCKHEED Super Connies being processed on block-long final assembly line at Burbank, Calif. Five of 68 Super Connies on order are shown being built.





FAIRCHILD Packet details are highlighted in these two closeups taken on the assembly line. Production worker in far left photo is installing hot air ducts in a tail boom, part of the plane's anti-icing system. In right photo, a C-119 takes shape as center section nears completion. Next step will be to attach outer wing panels and tail booms.

Have Helped Make Aviation History

At the end of World War I, aviation faced a critical situation. Production of high-octane aircraft fuels had made possible higher compression engines with greater power out-put and improved fuel economy. But — these advancements seemed destined to failure for want of exhaust valves which could take the punishment imposed by higher compressions, leaner mixtures, and higher engine speeds.

Engineers in many countries were experimenting with so-called "self-cooled" valves. The first to be successful was an engineer at McCook Field. In 1922 he conceived the idea of a hollow valve partly filled with sodium and potassium salts. In operation the salts liquefied and splashed from one part of the valve to another, picking up heat from the valve head and transferring it to the stem, where it was dissipated into the guide, cylinder head, and cooling system.

This organization took over the development and perfecting of the idea, as well as solving the knotty production problems involved in forging and machining the highly precise internal cavity. Metallic sodium later proved superior to the salts originally used, and this type of valve became known as the Sodium-Cooled Valve.

Sodium-cooled valves permitted the building of engines with previously undreamed-of power. By the beginning of World War II, they were used in all aircraft engines of 300 or more horsepower. Sodium-cooled valves have literally *made possible the modern reciprocating aircraft engine;* they have been one of the most important single factors in the development of commercial and military aviation.

Eaton has been privileged to work in close cooperation with the aircraft industry in developing many other advancements, and in furnishing such vital parts and equipment as valves, valve seat inserts, hydraulic valve lifters, tappets, coil springs, dynamometers, and turbo-jet engine parts.

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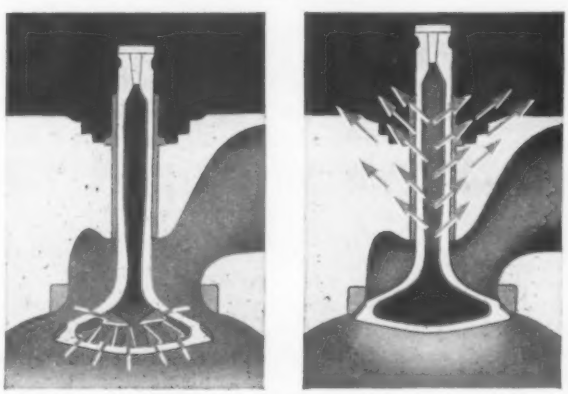
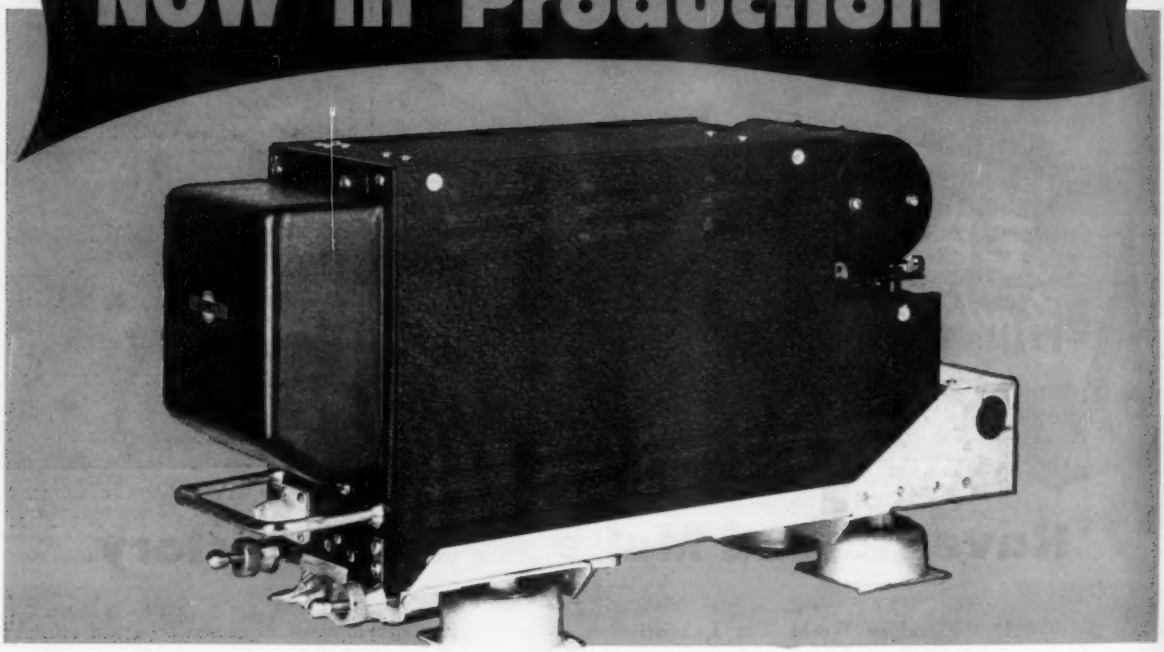


At operating temperatures, the sodium inside the valve liquefies. At the left, arrows show how heat is picked up by the sodium from the extremely hot valve head. Motion of the valve splashes the liquid sodium from one part of the valve to another, transferring heat to the cooler stem. At the right, arrows show how heat is dissipated into the valve guide, cylinder head, and cooling system.

NOW in Production



Collins 51V Glide Slope Receiver

The design of the Collins 51V-1 receiver, now on the assembly line, is based on "Glide Slope Receiver Characteristics" issued by Aeronautical Radio, Inc.

This receiver, together with the Collins 51R navigation equipment, will fulfill ILS receiving requirements for commercial and private as well as military aircraft.

The 51V is designed for reception of 90/150 cps tone modulated glide slope signals on all ten present and ten planned channels in the UHF range of 329-335 megacycles. It utilizes crystals identical with those employed in R-89B receivers and is electrically and mechanically interchangeable with modified ten channel R-89B's, greatly simplifying installation in present aircraft.

The 51V receiver control circuits are integrated with the standardized R/theta channeling system, with channel selection provided by a Collins type 314U remote control unit.

Choice may be had of a dynamotor for 12 or 24 volt d-c operation or an a-c power unit for operation from 115 volt 400 cycle supply.

If you are not thoroughly acquainted with this new glide slope receiver from previous contact or correspondence, write us for the 51V illustrated descriptive bulletin.

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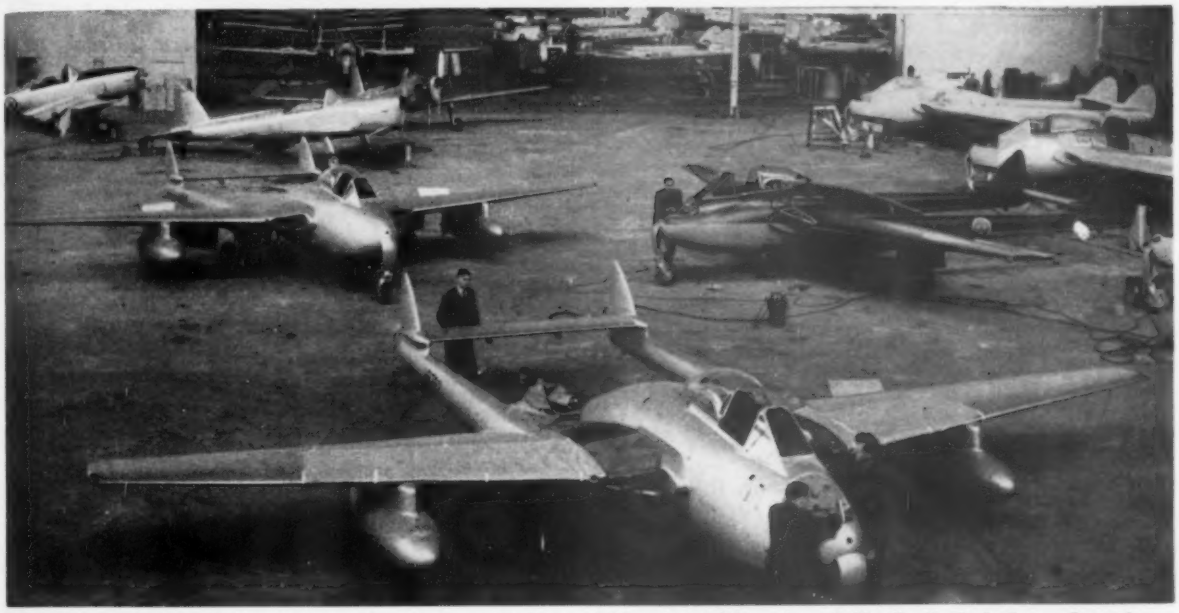

FIVE AIR FORCES will take delivery on these Chipmunk trainers and Vampire jet fighters from de Havilland, which also produces the . . .

COMET, world's first turbojet transport, shown cruising high above cloud level. Later models mount Avon engines for increased range.

British Build Planes at 'Reasonable Rate'

Industry ready to roll if it can get dollars, tools; huge Britannia transport may be U. S. competitor.

By David A. Anderton

London—The factories that turned out thousands of Spitfires and Lancasters, Halifaxes and Beaufighters during the war are beginning to stir again. A new breed of aircraft is about to go into production in locations all over England, to be the replacements for the veteran Vampire, Meteor and Lincoln.

And existing lines are still producing —with variations—the basic few aircraft that Britain's military services standardized in the postwar years.

► **Cross Section**—After the Farnborough display, sponsored by the Society of British Aircraft Constructors, I visited four airframe manufacturers whose products seemed to represent a fair cross-section of the British industry. Their aircraft included military and civil types powered by the complete current range of engines and carrying from one to 100 persons.

A previous report described the Airspeed division of the de Havilland Aircraft Co. and the Supermarine division of Vickers-Armstrongs (AVIATION WEEK, Oct. 29, p. 21).

The other two plants visited were the airframe plant of de Havilland at

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THIS WAS Dove production, but Comet and Heron now share the Hatfield floor.

Hatfield, and the airframe works of Bristol Aeroplane Co. at Filton near Bristol.

De Havilland

The headquarters of the de Havilland Enterprise is at Hatfield, a short bus ride from London in Hertfordshire. In addition to the usual business and administrative offices, the Hatfield plant also represents a sizeable portion of de Havilland's production potential. Engine and propeller test stands, an experimental shop, structures laboratory and de H's technical school are housed around the perimeter of the airfield.

But Hatfield's chief claim to fame is that it is the home of the Comet and the only production plant for that famous turbojet transport.

• **Comet 1** is a 36- to 44-seat turbojet transport, powered by four de H Ghost 50 engines, each delivering 5,000 lb. sea level static thrust. Cruising speed is just under 500 mph. at altitudes above 35,000 ft. Still-air range (and it should be noted that this is purely a fiction, because it does not include diversion, head winds, stacking or reserve) is over 3,000 mi.

• **Comet 2** is the same airframe, but in the interest of increased range, the Ghost engines have been replaced by Rolls-Royce Avon 1 turbojets. Each of these engines delivers 6,500 lb. (which is a conservative value) sea level static thrust.

In addition to the Comet, Hatfield produces some Vampires, did produce Doves and is starting to make Heron four-engine feederliners.

There were two major reasons for seeing de Havilland's plant this year. One was to check Comet progress to compare with a visit in 1950 after the Farnborough show), and in particular the production floor layout which features a series of small tracks at right angles for moving components (AVIATION WEEK, Aug. 6, 1951, p. 41).

The other reason was to see the development of the Series 2 Comet with Avon engines, primarily to examine the changes which were necessary when the powerplant shift was made.

► **Organized Disorder**—Regrettably, the first impression of the Comet production floor was the same as last year's—that the place is a study in confusion. There appears to be no rhyme or reason for the way planes and component assemblies are spotted around the floor. And the presence of the track system was not noted until one of the tiny rails bolted to the factory floor was seen.

It's the second look that clears up the feeling of confusion. There definitely is a flow pattern, components do arrive at the proper station at the proper time, and once you get used to the idea that the Comet is not on a production line, the rest is easy.

The current production rate of the Comet is better measured in units per year instead of units per month.

This actually is as it should be, because the total quantity of Comets on order does not demand volume production methods. It would be entirely too costly to set up a fast-moving line to bang out great numbers of these planes.

And de Havilland faced some uncertainty in orders placed for the Comet; even now, there are some tentative commitments made which have not become firm. In the offing is the changeover to Avon Comets for BOAC. And only recently did BOAC standardize on the interior arrangement of the plane.

None of these factors has been an inducement for DH to hurry.

But from here on, production of the Comets—barring material shortages—should pick up speed. The preliminaries are out of the way, the planes have

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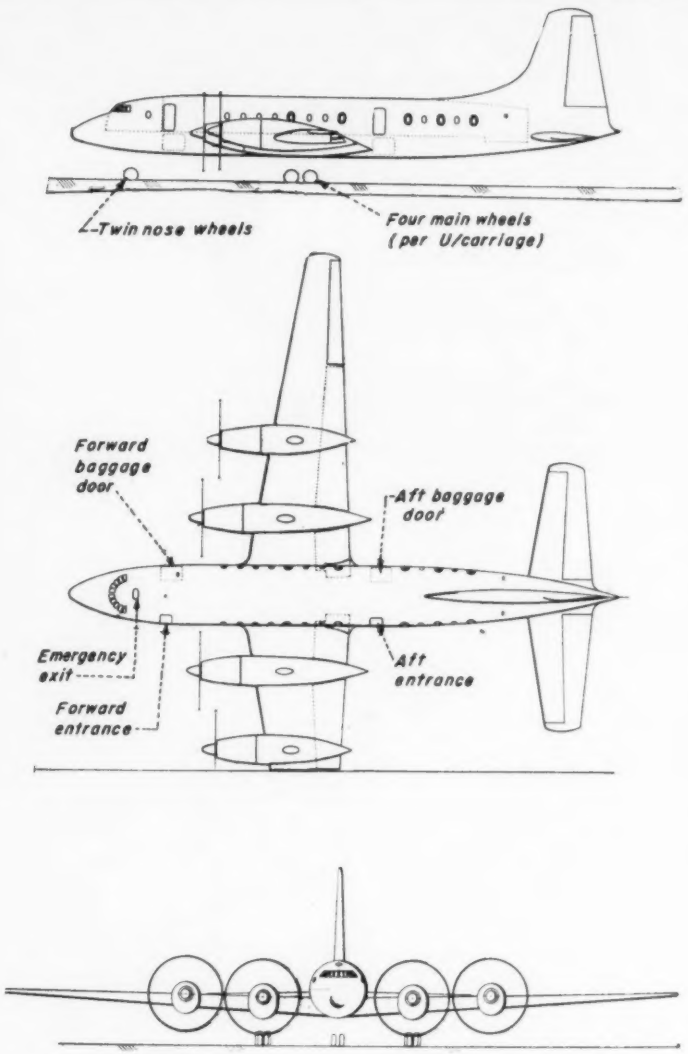

Bristol 175 Specifications

Wingspan	140 ft. 0 in.
Length	114 ft. 0 in.
Height (three-point)	36 ft. 8 in.
Wheel tread	31 ft. 0 in.
Wing area	2,055 sq. ft.
Fuel capacity	6,950 U. S. gal.

Four Bristol Proteus turboprop engines at 3,200 bhp. each

accumulated a large amount of flight time, the point of changeover to Avon Comets is fixed, the interior is finalized and the BOAC crews are checked out in the craft.

► **Avon Progress**—The first—and so far, only—Avon Comet occupies a large chunk of de Havilland's paint room which has been temporarily set up as an experimental shop. To all appearances, the Avon Comet is just like the Ghost Comet. When the craft was originally laid out, the engine bays were designed to take the larger engines which the de Havilland design staff felt would be coming along some day. And the airframe was stressed correspondingly.

As a result, the Avon engines (which incidentally are not much smaller in diameter than the Ghost) fit neatly into the engine bays. No actual Avon engines are on the floor; instead DH crews are working with a pair of beautiful wooden and steel mockups painted silver and blue.

The airframe is nearly complete, and the biggest task remaining is the installation of the Avons. Consequently, first flight date should not be too far off. De Havilland isn't willing—and they're justified—to give a prospective flight date. A good guess is early 1952.

► **New Nightfighter**—The DH 110, twin-Avon all-weather fighter, was announced shortly after this visit. It is a logical next step in the evolution of advanced types from the basic Vampire layout, and probably will be built in the same plants that supply Vampires to the RAF and a dozen other air forces.

The production order for the DH 110 should have little effect on Comet operations, because phaseout of the latter probably will be under way before the 110 gets into full production.

So, barring war or a critical shortage of aluminum and jet engines, the production future of the Comet is clear.

Bristol

Bristol's Filton works is a hodgepodge of ancient and modern buildings on top of a hill, spilling down the slope and onto the plain at the bottom. Inside this masonry melange, 16,000 employes make airplanes, helicopters, reciprocating and gas turbine engines—and a small auto retailing for roughly $8,700.

The engine works, which employs little more than half the labor staff, currently is producing five types of powerplants:

- **Hercules piston engines** of twin-row, 14-cylinder layout, delivering takeoff horsepowers in the 2,000-hp. class.
- **Centaurus piston engines** of twin-row, 18-cylinder layout, with takeoff ratings in the 2,500-hp. category.
- **Theseus turboprop,** in a class with the Hercules.
- **Proteus turboprop,** either as a single engine or as a coupled engine, with the former rated at 3,200-bhp. at sea-level takeoff, and the latter at 6,400-bhp. for the same conditions.
- **Olympus turbojet,** reported to be in the 10,000-lb. trust class.

Bristol's aircraft production is primarily of civil types which is rather surprising in view of the current situation, the space available and people employed there. It is difficult to figure out how so many workers can be gainfully employed on so few planes. Bristol is building:

- **Brigand,** a twin-engined, Centaurus-powered fighter bomber for the RAF, now in the closing stages of production.
- **Sycamore, or Type 171,** helicopter, a single-rotor, four- or five-place job for both civil and military customers. Bristol is building 25 of these.
- **Type 173 helicopter,** a twin-rotor, twin-engine prototype which will seat 12 to 15 passengers.
- **Type 170 Freighter,** powered by two Hercules piston engines and used for

Would You have Signed?

Jefferson, Adams, Harrison, Franklin and the rest did! Because they put the public welfare above every other consideration, their signatures on The Declaration of Independence changed the course of History. Would *you* have signed? Fortunately, most of us will never have to face a decision like that. Yet, daily, your signature does vitally concern the performance and reputation of your planes. Whatever your type of aircraft, your signature on the specifications directly affects thousands of people. A constantly growing number of aircraft designers, manufacturers and airline operators meets this obligation by specifying Eclipse-Pioneer instruments and accessories. Long experience with these products has bred respect for their performance. When your signature is required on a specification sheet, you can conscientiously feel you've chosen the best the field affords, when you indicate Eclipse-Pioneer.

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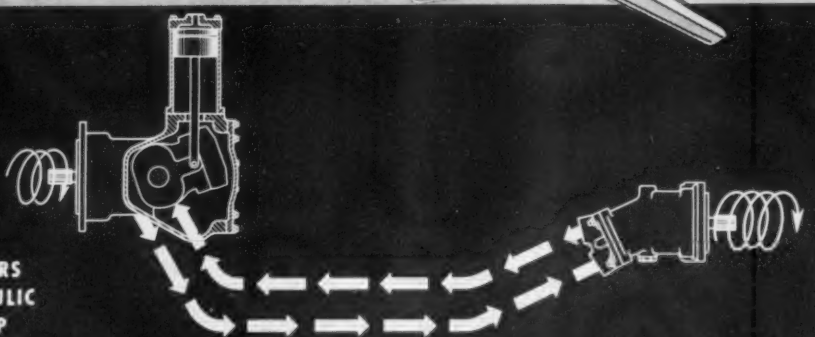

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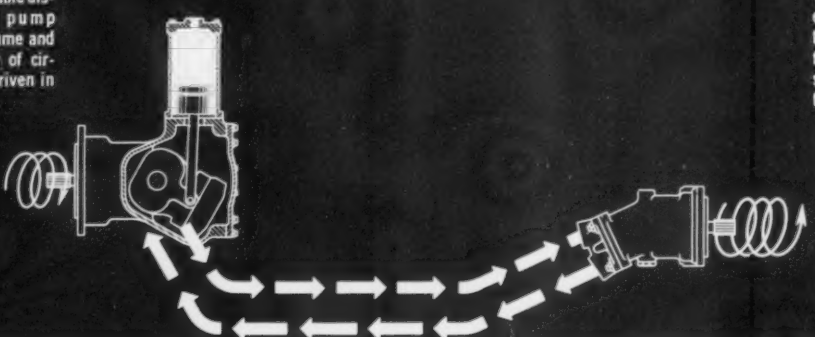

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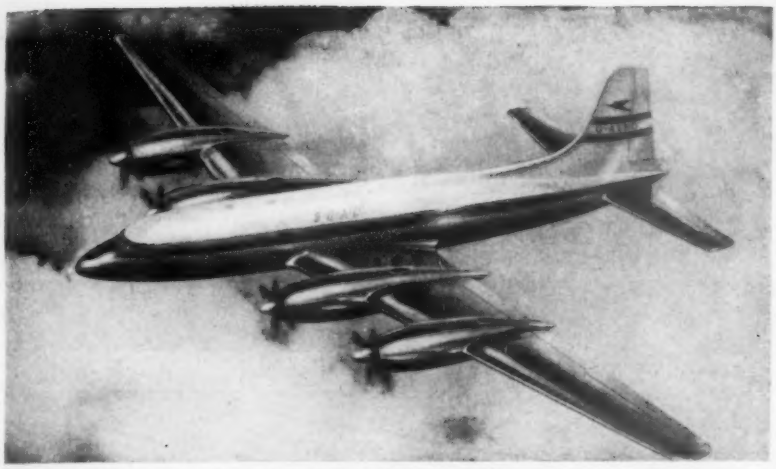
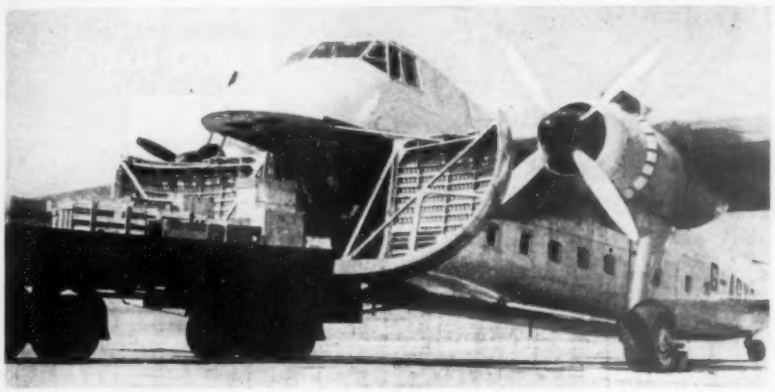


BRITANNIA transport, shown in artist's version, boasts four turboprop engines.



CARGO is loaded through nose-doors of Britsol 170, heavy-haulage British freighter.

heavy haulage throughout the Empire.
• **Type 175 Britannia,** future trans-Atlantic turboprop transport for BOAC.
• **Brabazons, Mk. 1 and 2,** giant, eight-engine transport prototypes.

Time limitations permitted only a quick look at the helicopter assembly areas, the giant assembly hall where the Brabs and the Britannia are being built and sections of the plant containing the Britannia mockup and component jigs.

The Type 173 copter had just been through part of its ground runs and was back in the hangar with its rotors off. Around it were clustered a number of Sycamores in warpaint and polished aluminum.

It seemed that there was some clutch trouble and the craft were temporarily out of service while the difficulties were being remedied.

The second prototype 173 was well along, with fuselage structure completed. It is to have landing gear more like that of the Sycamore, a departure from that of the first prototype.

And the third craft in the series already is in the jigs being built. Once these rotocraft are ordered—or perhaps, if they are ordered—Bristol should be able to turn them out in great quantity, or quickly, because the structure is very simple. The entire fuselage is a simple monocoque tube, with the exception of the nose—taken straight from the Sycamore—and the tail section.

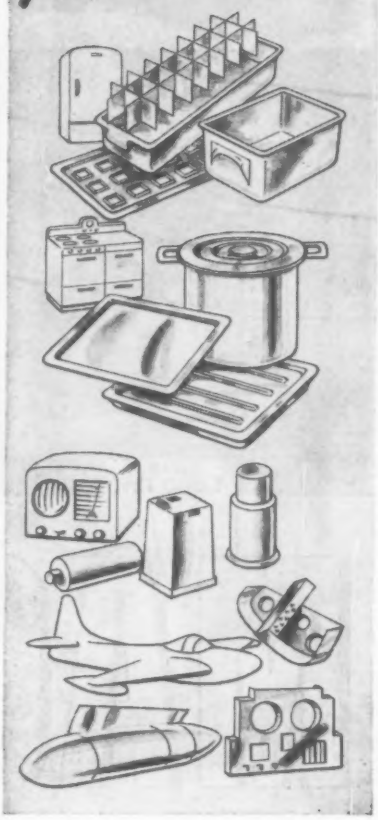
▶ **Brabazon Progress**—The Brabazon sisters sat under the high roof of the assembly hall which was built particularly for them. The Mk. 1 Brab had just come back from its static showing at Farnborough, and was undergoing tests of the power control system for the rudder. It also looked like it had a brand-new rudder.

The Mk. 2 fuselage is off to one side of the hall in an assembly fixture, and there is a wing section in a nearby fixture. This airplane, which will represent a considerable change from the piston-engined Mk. 1, appears to be a long way off—probably a year or so.

• **The Britannia fuselage shares the central bay of the hall with the Mk. 2 Brab. It also looks like first flight is 15 or 18 months away.**

This project, which has attracted so much attention here and in Britain, is a four-engine turboprop transport, intended for trans-Atlantic service with BOAC. Gross weight of the craft is currently pegged at 130,000 lb. and

Is Metal Fabrication your Problem?



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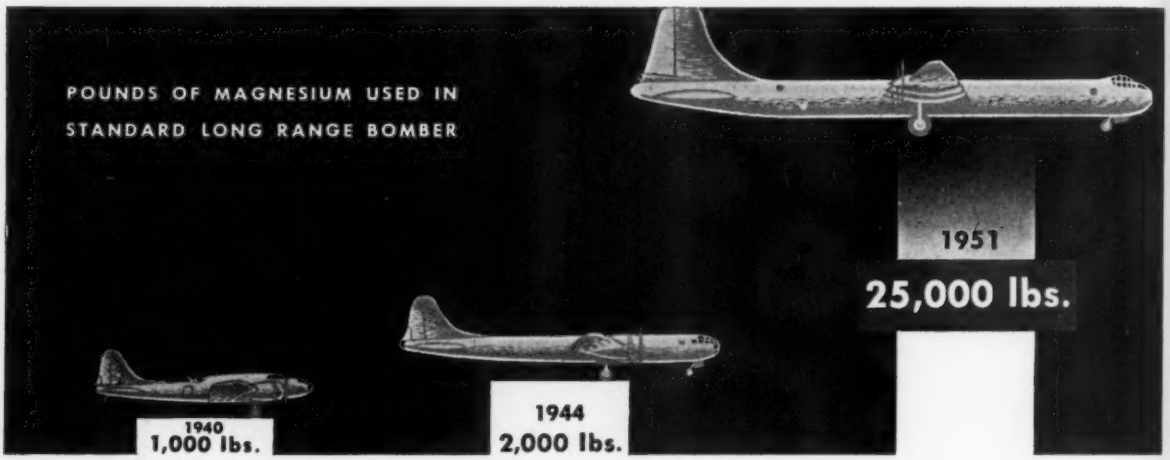

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More payload! That's what modern aircraft design demands—and that's why magnesium, the world's lightest structural metal, finds ever increasing use in air transportation. One-third lighter than the next lightest structural metal, it cuts important pounds off weight, without sacrificing strength. As a result today's bomber covers greater distances, at higher altitudes and increased speeds—with more payload!

In addition to its lightness, magnesium is easily fabricated. All forms of fabrication may be used: castings, forgings, extrusions, sheet and plate. In many cases, magnesium is actually the lowest cost metal since it permits noteworthy economies in fabrication.

Wherever a product is made to be moved or lifted, magnesium should be investigated. A vital metal in air transportation today, it offers even greater design improvements for tomorrow. Keep your eye on magnesium if your aim is light weight.

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its wingspan is 140 ft. Four Proteus engines power the Britannia. Its closest geometric counterpart now in service would be Boeing's Stratocruiser.

Seating capacity varies from 50 to 100, depending on the customer's choice of interior arrangement and on the stage length.

There are bits and pieces of the airplane throughout Bristol's shops. Judging by the quantity of components, there are enough parts for about five complete airplanes—but probably four of them will never fly. Instead, they will become test pieces—wings to be vibrated and broken, fuselages to be loaded and pressurized.

One sure way to get an impression of an airplane is to get inside and poke around.

In the case of the Britannia, the only available fuselage was being assembled, and had no interior fittings. Lacking the real thing, it was next best to inspect the mockup, remembering that these temporary structures of wood and cardboard are more roomy and neater than the final aircraft.

▶**Roomy Interior**—The passenger entrance to the Britannia is opposite a neat galley which serves as a dividing partition between the forward and aft cabins. One possible arrangement of these cabins would place the passengers in double seats on each side, 32 in the forward cabin and 20 in the aft cabin. With such seating, the plane would not be too crowded; but the figure of 100 passengers seems like overdoing it.

Toilets are at the extreme rear of the fuselage. In the mockup, it has been assumed that the female is infinitely fussier than the male—comforts for the men definitely are primitive. And this is important on long hauls like the Atlantic crossing—there is no room for three men to shave simultaneously as in the Stratocruiser, for one example.

▶**Pilot's Position**—The cockpit is a neat layout, but only a rough approximation of the real thing. For instance, all the overhead panels with myriad switches are only drawings, and contain none of the scalp-ripping toggles that are found in the usual installation.

As in real plane, getting into the pilot's seat meant some body contortions.

Feet have to be led carefully past the pylon and around to the front of the seat, body bent over and head ducked low.

Once you're in the pilot's seat, things are definitely better. The forward and downward fields of vision are excellent: port outboard engine can be seen easily by turning the head, and the port inboard by a little torso twisting. The control yoke is simple and small, affording minimum obstruction to the view of the instrument panel.

One novel installation places a navigational radar scope to the left and slightly

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above the pilot's left knee. Actually it's too low to see into with comfort, but there isn't any other obvious location for it.

▶ **General Assessment**—Although it just isn't possible to assess the overall structure from a mockup and some components scattered over several acres, it does appear that the Britannia is a conventional airplane, built in a conventional manner.

Bristol has had enough big plane experience to handle the job with competence.

So the Britannia just might be the plane to beat on the trans-Atlantic trip. Judged on its current state, the craft shouldn't be any threat to U. S. operators and manufacturers until 1955, if then. And it's a cinch that if the Britannia does prove out, BOAC's orders will tie up Bristol to the point where any other operator would be getting delivery dates around 1960.

As far as Bristol is concerned, it appears that the tremendous plant area available is hardly being used.

The assembly hall for the Brab could hold at least two fighter lines without disturbing anything now in there. And Bristol has enough supporting shops—machine, detail parts, cutting and routing, press—to take such an expansion almost in its stride.

But Bristol is one of the very few British manufacturers apparently having no new military designs upcoming. At least it was the only major firm which did not have a single rumor of new planes to its credit.

So Bristol's strength would seem to be in its potential production energy and in the tremendous possibilities inherent in the gigantic floor area of the Brabazon's assembly hall.

▶ **Conclusions**—It is rather dangerous to attempt to draw specific conclusions from a sketchy sampling of the British aircraft industry. But some comments were made again and again at the plants visited, and many of the speakers added that those views were held throughout the industry.

• **One overall conclusion:** British production of aircraft is at a reasonable rate, considering the handicaps of labor shortages, housing shortages, tool shortages and dollar shortages. With some support from Mutual Defense Assistance Program moneys (which would furnish machine tools, for example), production could increase substantially without the need for large labor increases. And one executive felt that once he was able to get the machines he needed, he would have no trouble building up his labor staff. This was not a general opinion, however.

• **Another** overall conclusion is that the British aircraft people are well aware of their industrial limitations and are trying to do something about them, instead of just letting things go on in the usual way of "muddling through."

• **And a third** is that the potential is there, just as it was at the beginning of World War II.

That potential, coupled with the "let's-get-cracking" attitude evidenced in the talk around the industry, is a great asset to the free countries of the world.

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She's thankful for the drumstick. We're thankful for girls like Winona Cox, 23, with hazel eyes and brown hair. When she isn't working for an electrical company, Winona spends her time golfing, swimming, and dancing. (No. 2 in a series of pretty Dallas girls discovered and photographed especially for Southwest Airmotive).

Aircraft Hydraulic Parts is Clinic Topic

Safety fluids, tubing and fittings for hydraulic systems will be discussed in detail at a transport aircraft accessory

The Well Tempered Aircraft—III

Modification vs. New Design

● As soon as today's military plane is in production, tomorrow's should start on the drawing boards.

● But civil models should be continued, with changes, until they fall behind the curve of progress.

Under the title "The Well Tempered Aircraft," Arthur E. Raymond, vice president-engineering, Douglas Aircraft Co., delivered the 39th Wilbur Wright Memorial Lecture before the Royal Aeronautical Society in London Sept. 10. Because it is the most thorough approach to the problems of constructing today's aircraft made by a recognized authority in recent months, AVIATION WEEK is publishing the major portion of Mr. Raymond's paper in installments, including copies of the original drawings. Two previous installments, Oct. 15 and 22, discussed five of Mr. Raymond's eight fundamental elements essential to production. This final installment covers the other three.

6. Thorough Exploitation

A well-conceived, well-executed, and well-developed aircraft can usually be adapted to a wide variety of uses over a period of years, thus extending its market and lengthening its life span. If it has been made inherently adaptable in the first place, taking into consideration during original design the modifications likely to occur later, not only will these modifications be made easier but it will not be so difficult to make worthwhile major changes which could not be anticipated.

If the foundation has been well-laid, the superstructure can be very elaborate.

It has been estimated that successful military aircraft undergo on the average, during their useful life, modifications totaling at least half of their original cost. These are major changes introduced into the production line from time to time, either to improve performance of the basic model, or to fit it for different uses. . . .

The record for successful civil aircraft is much the same, for these find their way to many different customers, each of which requires variations in interior arrangement or in equipment to meet

plored to the utmost.

Efforts in this direction are often far more rewarding than switching to a completely new design. Every new aircraft design represents a heavy investment and a long development time. . . .

► **New Markets**—It is not always apparent to a prospective user that such-and-such an aircraft is just what he needs. Tactical analyses of military aircraft and route studies of civil aircraft help to bring out clearly what they can do under certain specific conditions. Performance tabulations and flight demonstrations are useful, but detail studies carried out jointly by designer and operator of the way in which a given aircraft fits into an operation are also needed.

Essentially, the problem is to see that every potential user knows that the aircraft exists, what its characteristics are, and what it can do for him in true comparison with other available aircraft. . . .

7. Correct Succession

Regardless of how good the aircraft may be, there comes a time, and it may come imperceptibly, when it becomes uneconomical to continue production. Any further modifications will cost more

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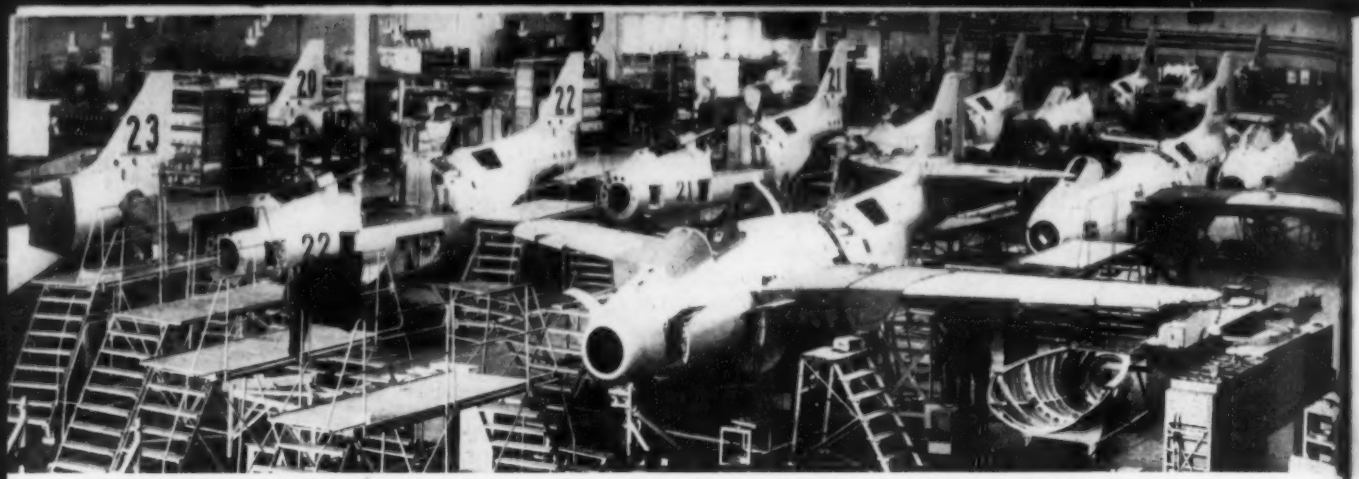
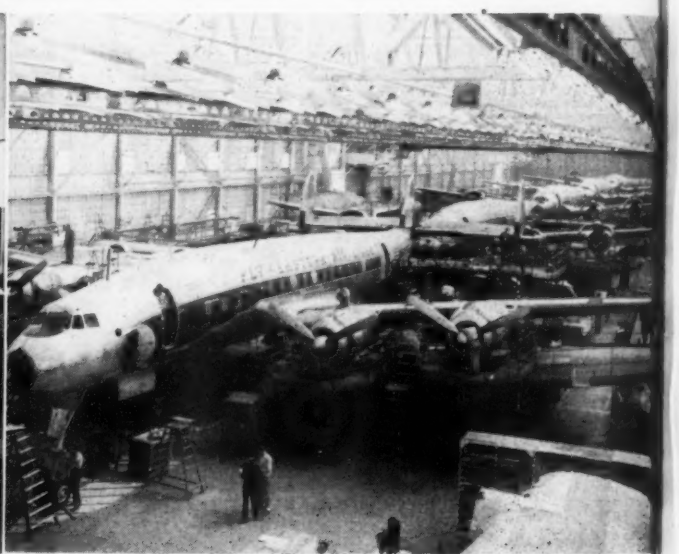


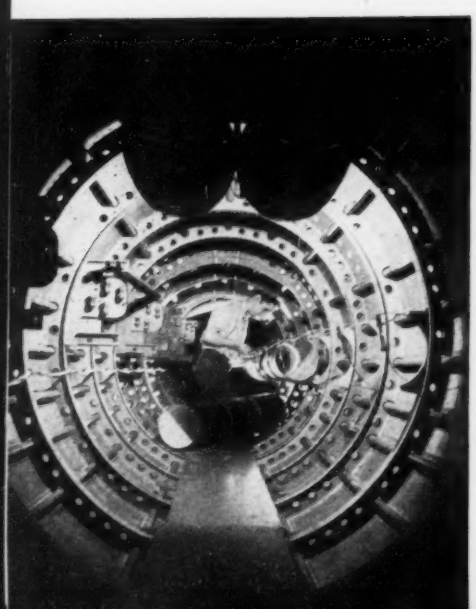
SAAB plant at Linkoping, Sweden, shown here busy turning out J-29 sweptwing fighters (Swedish-built DH Ghost engines), seems to make full use of available space.

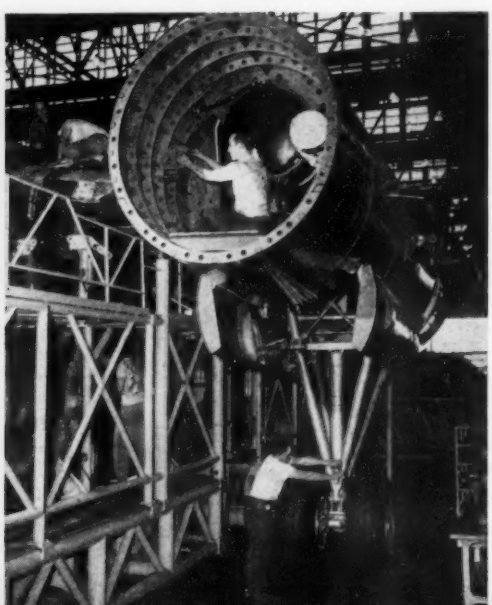
Down the Line—Here and Abroad

SIKORSKY S-55s for Navy, USAF, Marines take shape on the company's Bridgeport, Conn., line. Roomy fuselage makes it easier to handle interior.



LOCKHEED Super Connies being processed on block-long final assembly line at Burbank, Calif. Five of 68 Super Connies on order are shown being built.





FAIRCHILD Packet details are highlighted in these two closeups taken on the assembly line. Production worker in far left photo is installing hot air ducts in a tail boom, part of the plane's anti-icing system. In right photo, a C-119 takes shape as center section nears completion. Next step will be to attach outer wing panels and tail booms.

FIVE AIR FORCES will take delivery on these Chipmunk trainers and Vampire jet fighters from de Havilland, which also produces the . . .

COMET, world's first turbojet transport, shown cruising high above cloud level. Later models mount Avon engines for increased range.

British Build Planes at 'Reasonable Rate'

Industry ready to roll if it can get dollars, tools; huge Britannia transport may be U. S. competitor.

By David A. Anderton

London—The factories that turned out thousands of Spitfires and Lancasters, Halifaxes and Beaufighters during the war are beginning to stir again. A new breed of aircraft is about to go into production in locations all over England, to be the replacements for the veteran Vampire, Meteor and Lincoln.

And existing lines are still producing —with variations—the basic few aircraft that Britain's military services standardized in the postwar years.

► **Cross Section**—After the Farnborough display, sponsored by the Society of British Aircraft Constructors, I visited four airframe manufacturers whose products seemed to represent a fair cross-section of the British industry. Their aircraft included military and civil types powered by the complete current range of engines and carrying from one to 100 persons.

A previous report described the Airspeed division of the de Havilland Aircraft Co. and the Supermarine division of Vickers-Armstrongs (AVIATION WEEK, Oct. 29, p. 21).

The other two plants visited were the airframe plant of de Havilland at

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THIS WAS Dove production, but Comet and Heron now share the Hatfield floor.

Hatfield, and the airframe works of Bristol Aeroplane Co. at Filton near Bristol.

De Havilland

The headquarters of the de Havilland Enterprise is at Hatfield, a short bus ride from London in Hertfordshire. In addition to the usual business and administrative offices, the Hatfield plant also represents a sizeable portion of de Havilland's production potential. Engine and propeller test stands, an experimental shop, structures laboratory and de H's technical school are housed around the perimeter of the airfield.

But Hatfield's chief claim to fame is that it is the home of the Comet and the only production plant for that famous turbojet transport.

• **Comet 1** is a 36- to 44-seat turbojet transport, powered by four de H Ghost 50 engines, each delivering 5,000 lb. sea level static thrust. Cruising speed is just under 500 mph. at altitudes above 35,000 ft. Still-air range (and it should be noted that this is purely a fiction, because it does not include diversion, head winds, stacking or reserve) is over 3,000 mi.

• **Comet 2** is the same airframe, but in the interest of increased range, the Ghost engines have been replaced by Rolls-Royce Avon 1 turbojets. Each of these engines delivers 6,500 lb. (which is a conservative value) sea level static thrust.

In addition to the Comet, Hatfield produces some Vampires, did produce Doves and is starting to make Heron four-engine feederliners.

There were two major reasons for seeing de Havilland's plant this year. One was to check Comet progress to compare with a visit in 1950 after the Farnborough show), and in particular the production floor layout which features a series of small tracks at right angles for moving components (AVIATION WEEK, Aug. 6, 1951, p. 41).

The other reason was to see the development of the Series 2 Comet with Avon engines, primarily to examine the changes which were necessary when the powerplant shift was made.

► **Organized Disorder**—Regrettably, the first impression of the Comet production floor was the same as last year's—that the place is a study in confusion. There appears to be no rhyme or reason for the way planes and component assemblies are spotted around the floor. And the presence of the track system was not noted until one of the tiny rails bolted to the factory floor was seen.

It's the second look that clears up the feeling of confusion. There definitely is a flow pattern, components do arrive at the proper station at the proper time, and once you get used to the idea that the Comet is not on a production line, the rest is easy.

The current production rate of the Comet is better measured in units per year instead of units per month.

This actually is as it should be, because the total quantity of Comets on order does not demand volume production methods. It would be entirely too costly to set up a fast-moving line to bang out great numbers of these planes.

And de Havilland faced some uncertainty in orders placed for the Comet; even now, there are some tentative commitments made which have not become firm. In the offing is the changeover to Avon Comets for BOAC. And only recently did BOAC standardize on the interior arrangement of the plane.

None of these factors has been an inducement for DH to hurry.

But from here on, production of the Comets—barring material shortages—should pick up speed. The preliminaries are out of the way, the planes have

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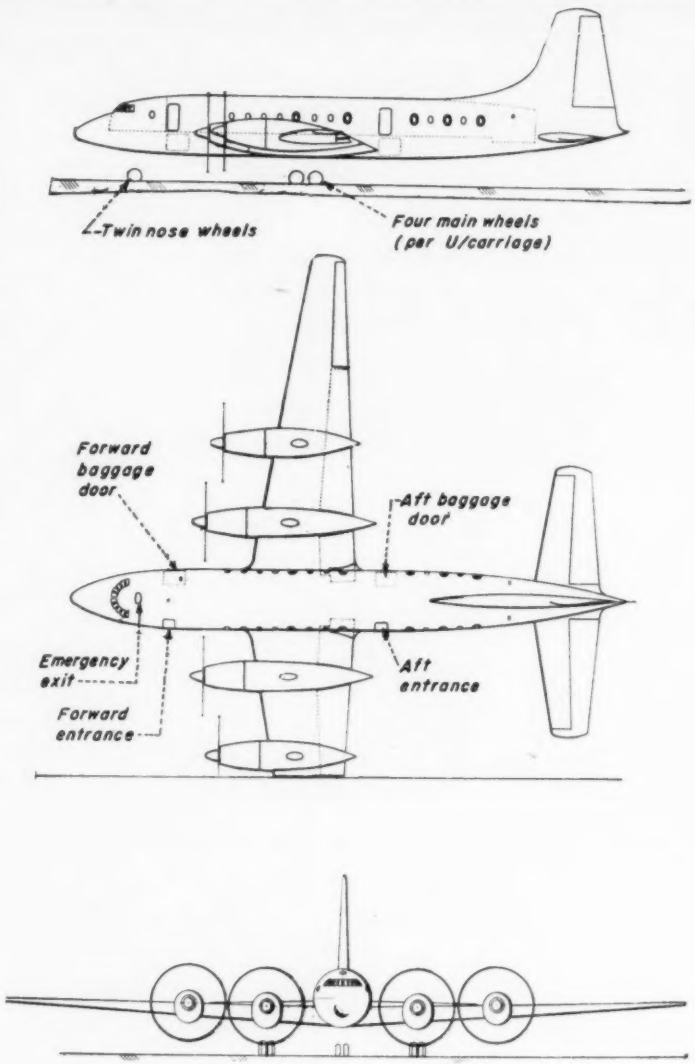


Bristol 175 Specifications

Wingspan	140 ft. 0 in.
Length	114 ft. 0 in.
Height (three-point)	36 ft. 8 in.
Wheel tread	31 ft. 0 in.
Wing area	2,055 sq. ft.
Fuel capacity	6,950 U. S. gal.

Four Bristol Proteus turboprop engines at 3,200 bhp. each

accumulated a large amount of flight time, the point of changeover to Avon Comets is fixed, the interior is finalized and the BOAC crews are checked out in the craft.

▶ **Avon Progress**—The first—and so far, only—Avon Comet occupies a large chunk of de Havilland's paint room which has been temporarily set up as an experimental shop. To all appearances, the Avon Comet is just like the Ghost Comet. When the craft was originally laid out, the engine bays were designed to take the larger engines which the de Havilland design staff felt would be coming along some day. And the airframe was stressed correspondingly.

As a result, the Avon engines (which incidentally are not much smaller in diameter than the Ghost) fit neatly into the engine bays. No actual Avon engines are on the floor; instead DH crews are working with a pair of beautiful wooden and steel mockups painted silver and blue.

The airframe is nearly complete, and the biggest task remaining is the installation of the Avons. Consequently, first flight date should not be too far off. De Havilland isn't willing—and they're justified—to give a prospective flight date. A good guess is early 1952.

▶ **New Nightfighter**—The DH 110 twin-Avon all-weather fighter, was announced shortly after this visit. It is a logical next step in the evolution of advanced types from the basic Vampire layout, and probably will be built in the same plants that supply Vampires to the RAF and a dozen other air forces.

The production order for the DH 110 should have little effect on Comet operations, because phaseout of the latter probably will be under way before the 110 gets into full production.

So, barring war or a critical shortage of aluminum and jet engines, the production future of the Comet is clear.

Bristol

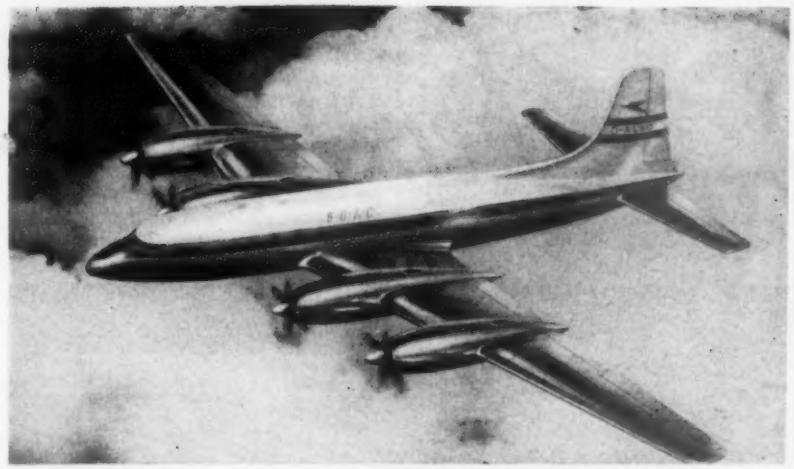
Bristol's Filton works is a hodgepodge of ancient and modern buildings on top of a hill, spilling down the slope and onto the plain at the bottom. Inside this masonry melange, 16,000 employes make airplanes, helicopters, reciprocating and gas turbine engines—and a small auto retailing for roughly $8,700.

The engine works, which employs little more than half the labor staff, currently is producing five types of powerplants:

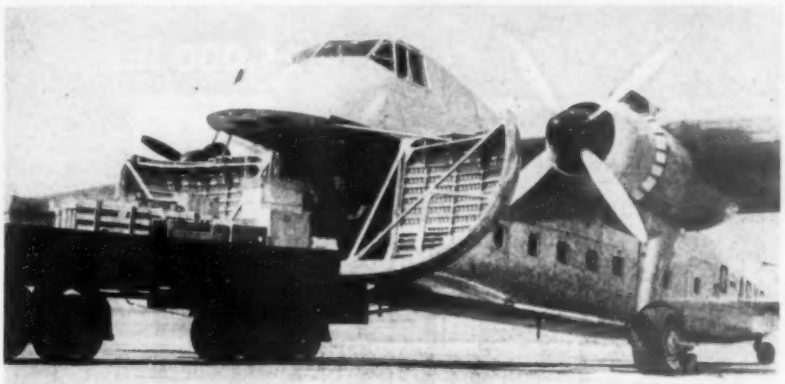
- **Hercules piston engines** of twin-row, 14-cylinder layout, delivering takeoff horsepowers in the 2,000-hp. class.
- **Centaurus piston engines** of twin-row, 18-cylinder layout, with takeoff ratings in the 2,500-hp. category.
- **Theseus turboprop,** in a class with the Hercules.
- **Proteus turboprop,** either as a single engine or as a coupled engine, with the former rated at 3,200-bhp. at sea-level takeoff, and the latter at 6,400-bhp. for the same conditions.
- **Olympus turbojet,** reported to be in the 10,000-lb. trust class.

Bristol's aircraft production is primarily of civil types which is rather surprising in view of the current situation, the space available and people employed there. It is difficult to figure out how so many workers can be gainfully employed on so few planes. Bristol is building:

- **Brigand,** a twin-engined, Centaurus-powered fighter bomber for the RAF, now in the closing stages of production.
- **Sycamore, or Type 171,** helicopter, a single-rotor, four- or five-place job for both civil and military customers. Bristol is building 25 of these.
- **Type 173 helicopter,** a twin-rotor, twin-engine prototype which will seat 12 to 15 passengers.
- **Type 170 Freighter,** powered by two Hercules piston engines and used for



BRITANNIA transport, shown in artist's version, boasts four turboprop engines.



CARGO is loaded through nose-doors of Britsol 170, heavy-haulage British freighter.

heavy haulage throughout the Empire.
• **Type 175 Britannia,** future trans-Atlantic turboprop transport for BOAC.
• **Brabazons, Mk. 1 and 2,** giant, eight-engine transport prototypes.

Time limitations permitted only a quick look at the helicopter assembly areas, the giant assembly hall where the Brabs and the Britannia are being built and sections of the plant containing the Britannia mockup and component jigs.

The Type 173 copter had just been through part of its ground runs and was back in the hangar with its rotors off. Around it were clustered a number of Sycamores in warpaint and polished aluminum.

It seemed that there was some clutch trouble and the craft were temporarily out of service while the difficulties were being remedied.

The second prototype 173 was well along, with fuselage structure completed. It is to have landing gear more like that of the Sycamore, a departure from that of the first prototype.

And the third craft in the series already is in the jigs being built. Once these rotocraft are ordered—or perhaps, if they are ordered—Bristol should be able to turn them out in great quantity, or quickly, because the structure is very simple. The entire fuselage is a simple monocoque tube, with the exception of the nose—taken straight from the Sycamore—and the tail section.

► **Brabazon Progress**—The Brabazon sisters sat under the high roof of the assembly hall which was built particularly for them. The Mk. 1 Brab had just come back from its static showing at Farnborough, and was undergoing tests of the power control system for the rudder. It also looked like it had a brand-new rudder.

The Mk. 2 fuselage is off to one side of the hall in an assembly fixture, and there is a wing section in a nearby fixture. This airplane, which will represent a considerable change from the piston-engined Mk. 1, appears to be a long way off—probably a year or so.

The Britannia fuselage shares the central bay of the hall with the Mk. 2 Brab. It also looks like first flight is 15 or 18 months away.

This project, which has attracted so much attention here and in Britain, is a four-engine turboprop transport, intended for trans-Atlantic service with BOAC. Gross weight of the craft is currently pegged at 130,000 lb. and

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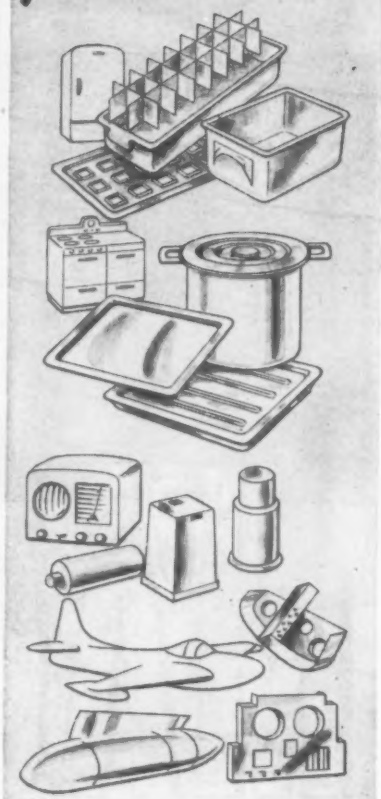

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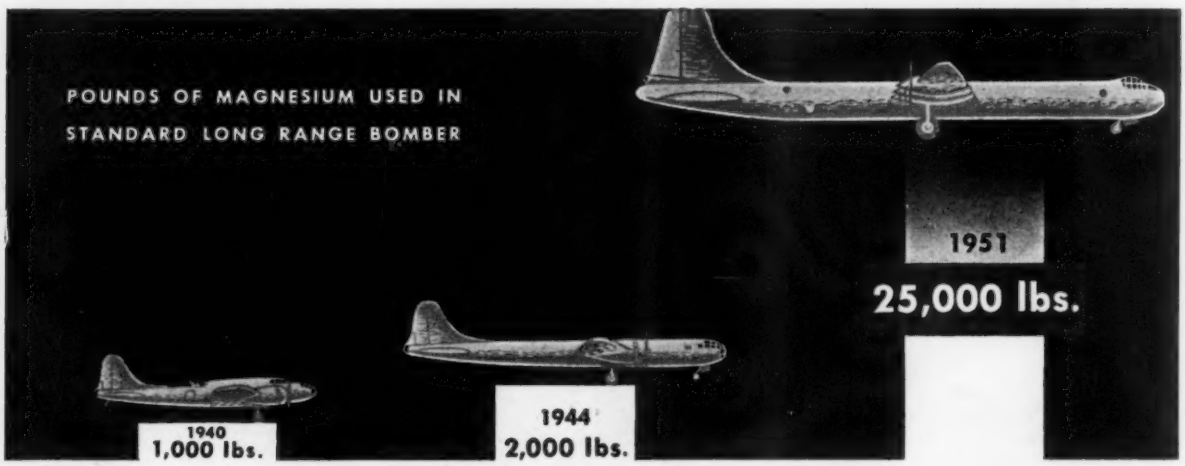

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its wingspan is 140 ft. Four Proteus engines power the Britannia. Its closest geometric counterpart now in service would be Boeing's Stratocruiser.

Seating capacity varies from 50 to 100, depending on the customer's choice of interior arrangement and on the stage length.

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above the pilot's left knee. Actually it's too low to see into with comfort, but there isn't any other obvious location for it.

▶ **General Assessment**—Although it just isn't possible to assess the overall structure from a mockup and some components scattered over several acres, it does appear that the Britannia is a conventional airplane, built in a conventional manner.

Bristol has had enough big plane experience to handle the job with competence.

So the Britannia just might be the plane to beat on the trans-Atlantic trip. Judged on its current state, the craft shouldn't be any threat to U. S. operators and manufacturers until 1955, if then. And it's a cinch that if the Britannia does prove out, BOAC's orders will tie up Bristol to the point where any other operator would be getting delivery dates around 1960.

As far as Bristol is concerned, it appears that the tremendous plant area available is hardly being used.

The assembly hall for the Brab could hold at least two fighter lines without disturbing anything now in there. And Bristol has enough supporting shops—machine, detail parts, cutting and routing, press—to take such an expansion almost in its stride.

But Bristol is one of the very few British manufacturers apparently having no new military designs upcoming. At least it was the only major firm which did not have a single rumor of new planes to its credit.

So Bristol's strength would seem to be in its potential production energy, and in the tremendous possibilities inherent in the gigantic floor area of the Brabazon's assembly hall.

▶ **Conclusions**—It is rather dangerous to attempt to draw specific conclusions from a sketchy sampling of the British aircraft industry. But some comments were made again and again at the plants visited, and many of the speakers added that those views were held throughout the industry.

• **One overall conclusion:** British production of aircraft is at a reasonable rate, considering the handicaps of labor shortages, housing shortages, tool shortages and dollar shortages. With some support from Mutual Defense Assistance Program moneys (which would furnish machine tools, for example), production could increase substantially without the need for large labor increases. And one executive felt that once he was able to get the machines he needed, he would have no trouble building up his labor staff. This was not a general opinion, however.

• **Another** overall conclusion is that the British aircraft people are well aware of their industrial limitations and are trying to do something about them, instead of just letting things go on in the usual way of "muddling through."

• **And a third** is that the potential is there, just as it was at the beginning of World War II.

That potential, coupled with the "let's-get-cracking" attitude evidenced in the talk around the industry, is a great asset to the free countries of the world.

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She's thankful for the drumstick. We're thankful for girls like Winona Cox, 23, with hazel eyes and brown hair. When she isn't working for an electrical company, Winona spends her time golfing, swimming, and dancing. (No. 2 in a series of pretty Dallas girls discovered and photographed especially for Southwest Airmotive).

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Aircraft Hydraulic Parts is Clinic Topic

Safety fluids, tubing and fittings for hydraulic systems will be discussed in detail at a transport aircraft accessory and system conference to be held Dec. 4-5 at the Hotel Sheraton, Detroit, under sponsorship of Vickers, Inc.

Vickers said it is sponsoring the meeting primarily to aid operators in getting more reliability from present hydraulic systems at the lowest cost, and that the clinic should be of interest to engineering and service representatives of manufacturers as well as to operators.

Robert R. Stark, assistant to the vice president-engineering Eastern Air Lines, who headed up the hydraulic session of the Air Transport Assn. conference in April, will act as general chairman of the Detroit meeting.

The Well Tempered Aircraft—III

Modification vs. New Design

● As soon as today's military plane is in production, tomorrow's should start on the drawing boards.

● But civil models should be continued, with changes, until they fall behind the curve of progress.

Under the title "The Well Tempered Aircraft," Arthur E. Raymond, vice president-engineering, Douglas Aircraft Co., delivered the 39th Wilbur Wright Memorial Lecture before the Royal Aeronautical Society in London Sept. 10. Because it is the most thorough approach to the problems of constructing today's aircraft made by a recognized authority in recent months, AVIATION WEEK *is publishing the major portion of Mr. Raymond's paper in installments, including copies of the original drawings. Two previous installments, Oct. 15 and 22, discussed five of Mr. Raymond's eight fundamental elements essential to production. This final installment covers the other three.*

6. Thorough Exploitation

A well-conceived, well-executed, and well-developed aircraft can usually be adapted to a wide variety of uses over a period of years, thus extending its market and lengthening its life span. If it has been made inherently adaptable in the first place, taking into consideration during original design the modifications likely to occur later, not only will these modifications be made easier but it will not be so difficult to make worthwhile major changes which could not be anticipated.

If the foundation has been well-laid, the superstructure can be very elaborate.

It has been estimated that successful military aircraft undergo on the average, during their useful life, modifications totaling at least half of their original cost. These are major changes introduced into the production line from time to time, either to improve performance of the basic model, or to fit it for different uses. . . .

The record for successful civil aircraft is much the same, for these find their way to many different customers, each of which requires variations in interior arrangement or in equipment to meet its own special preferences or conditions of operation.

▶ **Value of Modifications**—There is little use bewailing this tendency toward non-standardization. Modifications undoubtedly add to the cost, but without them the number of aircraft produced would be much less, which in itself would in all likelihood raise the unit cost even more.

At any rate, they cannot be avoided and it is the author's belief that it is for the general good that they be encouraged—in fact, that the designer bend every effort to see that every modification that looks at all promising be explored to the utmost.

Efforts in this direction are often far more rewarding than switching to a completely new design. Every new aircraft design represents a heavy investment and a long development time. . . .

▶ **New Markets**—It is not always apparent to a prospective user that such-and-such an aircraft is just what he needs. Tactical analyses of military aircraft and route studies of civil aircraft help to bring out clearly what they can do under certain specific conditions. Performance tabulations and flight demonstrations are useful, but detail studies carried out jointly by designer and operator of the way in which a given aircraft fits into an operation are also needed.

Essentially, the problem is to see that every potential user knows that the aircraft exists, what its characteristics are, and what it can do for him in true comparison with other available aircraft. . . .

7. Correct Succession

Regardless of how good the aircraft may be, there comes a time, and it may come imperceptibly, when it becomes uneconomical to continue production. Any further modifications will cost more than their benefit. In spite of the best efforts it is falling behind the curve of progress to such an extent that to continue with it will only lead to the drying up of sales or will be an invitation to competition to enter the market with something distinctly better.

This is the time when a new model should be through its development phase and ready for operation.

The new model must, therefore, have been started several years before.

It is not enough to acknowledge the point of obsolescence when it occurs; it must be foreseen considerably in advance. The rate at which obsolescence

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comes about varies between wide limits. It may be so rapid as to make the time when a new model should be started agree exactly with the time of greatest apparent success of the current model.

It is always anticipated that an aircraft project will be a success and plans are laid accordingly. The road to eventual justification may be rough and there may be many times when it takes courage and vision to stick it out and not to give up too soon. On the other hand, it may in fact prove to be a mistaken venture: perhaps the sights set by the specification were too high and the attempt to meet them has produced a design that is strained and not easy, one that can never be truly successful because it is so complicated; perhaps the need which seemed so apparent at the beginning has faded away under changed conditions. The difficulty here, in view of normal human stubbornness and pride, is to accept the mistake as a mistake, write it off, take a deep breath, and put down a fresh sheet of paper.

▶**Military Angle**—This problem of succession, when applied to military aircraft, has some special elements that are worth noting. The losses that a given air force will sustain in battle against the enemy depend upon its quality. If aircraft are not replaced from time to time with newer models, their attrition rate will be higher in the event of war. Replacements in wartime will then have to be more numerous, leaving aside the difficulty of getting them in time, and their total cost will be higher. This added cost will tend to offset the added cost that would have been incurred if more modern aircraft had been secured in the first place.

The penalty of allowing an air force to slip behind the state of the art through failure to renew is so great that a drastic policy of scrapping existing military aircraft and replacing with new ones as soon as they can be made available will pay in the long run.

In other words, as soon as today's bomber or fighter has been placed in production, tomorrow's should be started on the drawing board. In fact, since not all designs are successful, more than one should be started.

The manufacturer who rests on his oars too long is overwhelmed by competition; the country that rests on its oars too long is overwhelmed by the enemy. There has to be a very definitely established policy of cyclical progression to maintain a place in this world of constant change.

In times past it may have been enough to rely on having new aircraft at all times ready for production. The pace of modern warfare is putting an increasing bonus on air fleets-in-being; the new aircraft have to be introduced into production and the old ones retired according to a prescribed plan designed to maintain a high level of quality. . . .

8. Adaptiveness

Up to this point everything that has been said has given the impression that the production of a successful aircraft is merely a question of following certain rules. Starting with certain ingredients and mixing them in a certain way we get an assured result.

Looking back over the example of success and failure in the author's intimate knowledge, it is all too apparent that this is far from being the whole story. Things happen which might have been foreseen but were not; things happen that could not possibly have been foreseen. The total of these unplanned-for happenings often turns out to be the deciding factor.

▶**Deficiencies in Planning**—This is an age of planning. It has come about because the very complexity of modern society, government, and technology requires that a great deal of attention be given to planning if things are to be kept under any semblance of control at all. At the same time, some of these problems are so intricate that it is absolutely impossible, at least within the time available, to establish all the variables with accuracy.

The planning must therefore be im-

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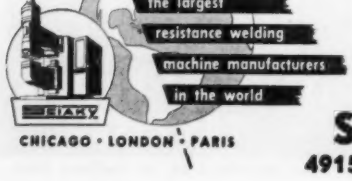

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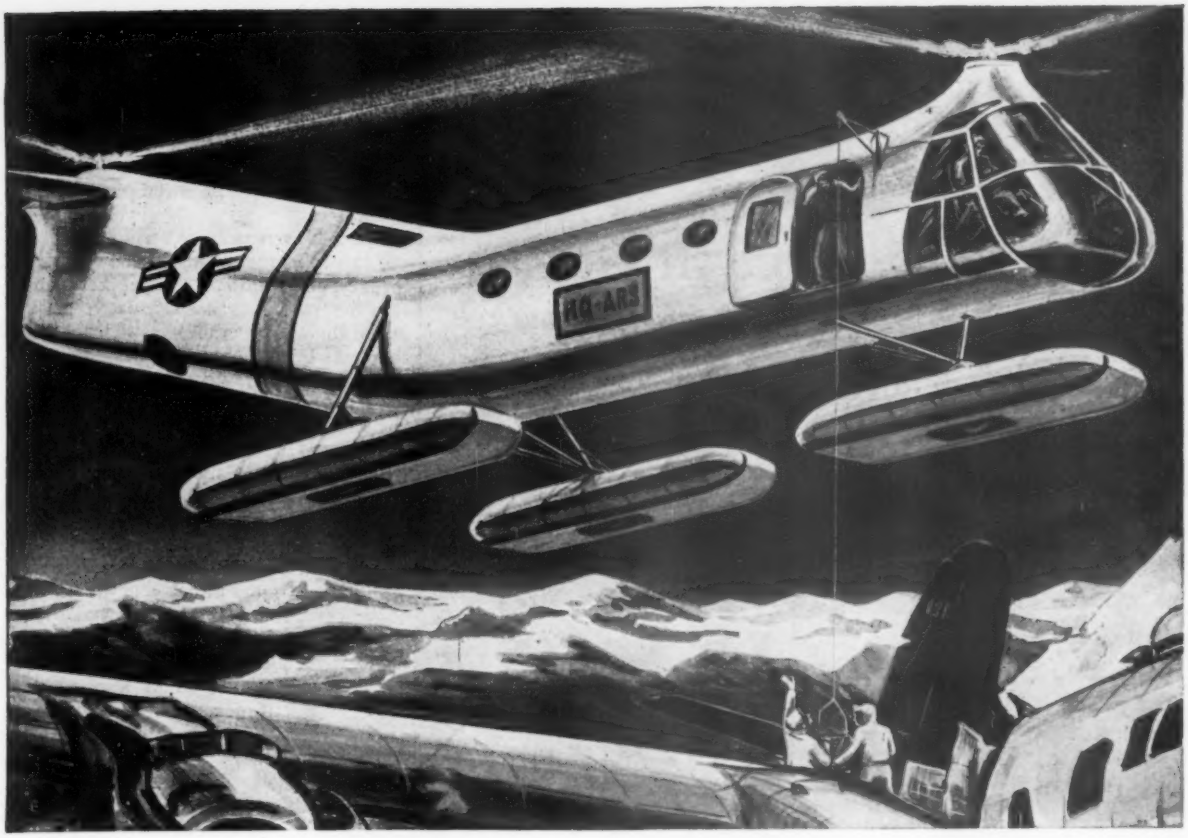

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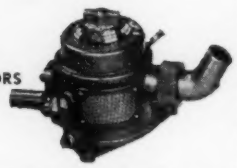

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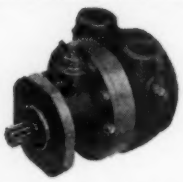

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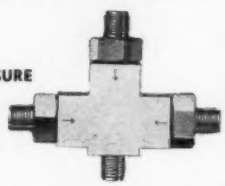

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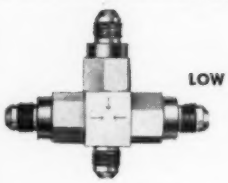

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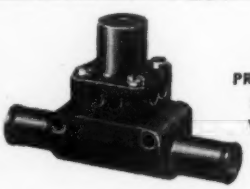

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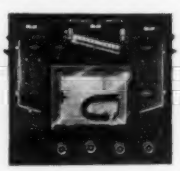

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perfect and the danger is that it may cause those concerned to lose their resilience and their ability to be fast on their feet in dealing with the unexpected. The following is an apt quotation in this connection: "The absence of an undue amount of planning and co-ordination is an essential prerequisite of progress."*

► **Luck**—Occurrences over which one has no control come in the general category of luck, good and bad. Sometimes plans can be made on an alternative basis when there is uncertainty as to what will happen, but often there is simply no way of anticipating the course of events.

The thing to do in such cases is to be on the alert to seize upon, and use to advantage, the favorable happenings and to be prepared to take steps to minimize the effect of unfavorable ones.

There have always been a great many people in the aircraft business whose attitude is optimistic and who expect the best. Many projects never would have been started if this had not been so. A surprisingly large proportion of these have been successful. . . .

The qualities of mind referred to, flexibility, optimism, and lack of caution, are youthful qualities. Aviation will undoubtedly always be a field which attracts young men and one which is benefitted by their presence. Those who have been in it for a good many years may be able to do their part by supplying the tempering judgment which only experience can bring, but they cannot allow themselves to think that they have all the answers. . . .

► **DC-3 Example**—As an illustration of the importance of the unplanned-for element, the case history of a familiar aircraft, the Dakota, is quoted. The specification for the forerunner of this aeroplane, the DC-1, was conceived in an atmosphere compounded of equal parts of optimism and ignorance. It called for an airplane which weighed 14,000 lb., that would take off and fly on one of its two engines between points having an elevation of approximately 5,000 ft. with a terrain clearance between them of 7,000 ft.

When finally completed, the DC-1 was 30% overweight and would never have been able to meet its specifications had it not been for two major and several minor developments which occurred during the course of construction and which were unforeseen at the time the contract was made.

One of these major developments was the variable pitch propeller and the other was a marked increase in engine horsepower. The DC-1 was able to make the required demonstration flight on one engine (in this connection refer-

* Development of Aircraft Engines, by Schlaifer, a Harvard Business School Publication.

ence might be made to the Wilbur Wright lecture of 1935) and met or exceeded its other performance requirements, but it was not good enough to be put into production without major modification. It was, in fact, the second attempt by an American manufacturer to build an aircraft of its class and type and benefitted by that fact, but it was still enough of a pioneering effort that by the time it was done it was apparent that it could have been done better.

▶ **Unforeseen Numbers**—Not one, but two, major modifications were required before the Dakota or DC-3 came into existence. This, it is generally agreed, has been on the whole a successful aircraft. How successful it was going to become was certainly not foreseen. The tooling was designed for a quantity of 50 planes and it was thought at the time that this was rather daring.

About 700 commercial planes were built from that tooling and duplicates thereof, but there probably would never have been more than 1,000 DC-3s built had it not been for the war, another unforeseen element in the planning.

At this point two completely new sets of tooling were built and nearly 10,000 military cargo versions were turned out.

The aircraft originated in the early '30s and the last one was built some 12 years later, at which time changes were still being incorporated to increase the service life of parts and to take care of new items of equipment or new uses.

At this point it would have been normal, certainly, to have introduced a completely new model, but economic conditions were such that instead a major conversion, the Super DC-4, was introduced, which has carried production up to the present time. . . . The DC-3 was lucky enough in its early years to so completely capture the market (and this was not the result of particularly good planning) that competition was thrown off balance.

It therefore has had the benefit of a rather unique position, but the fact remains that stern realism, undiluted by a certain light-hearted assumption of risk, might well have dampened the project in its early stages.

9. Conclusion

Implicit in this entire discussion of the well-tempered aircraft has been the idea of compromise between extremes. However easy to state as a principle this is extremely difficult to adhere to in practice. It is not enough to bring to bear on these problems a high degree of technical knowledge; nor is it enough to adopt a pragmatic approach.

In this connection there is an anecdote, credited to Dr. Karl Compton, which has come to mind many times through the years.

It seems that a sister of Dr. Comp-

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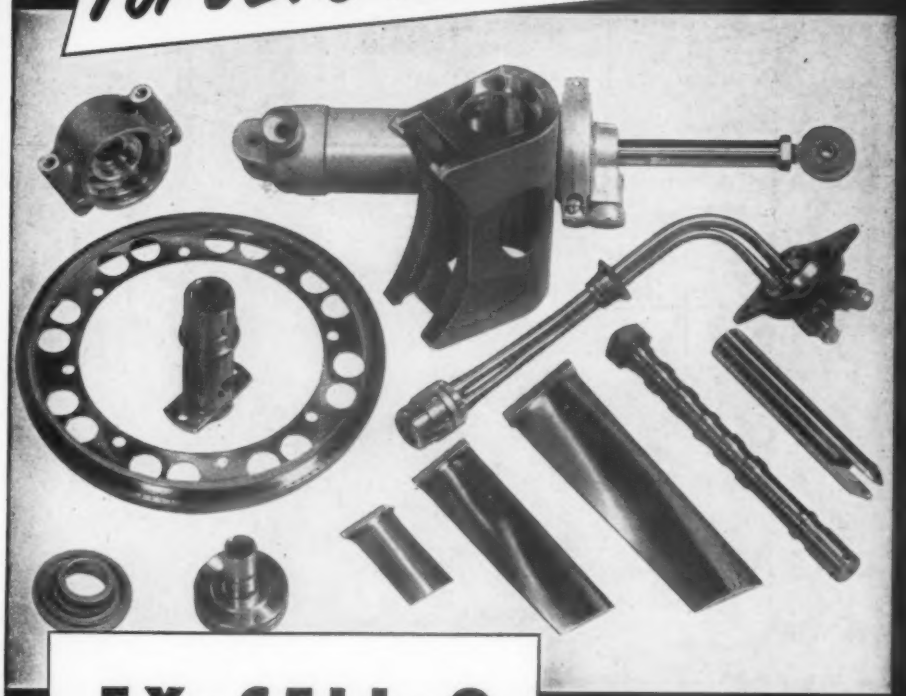

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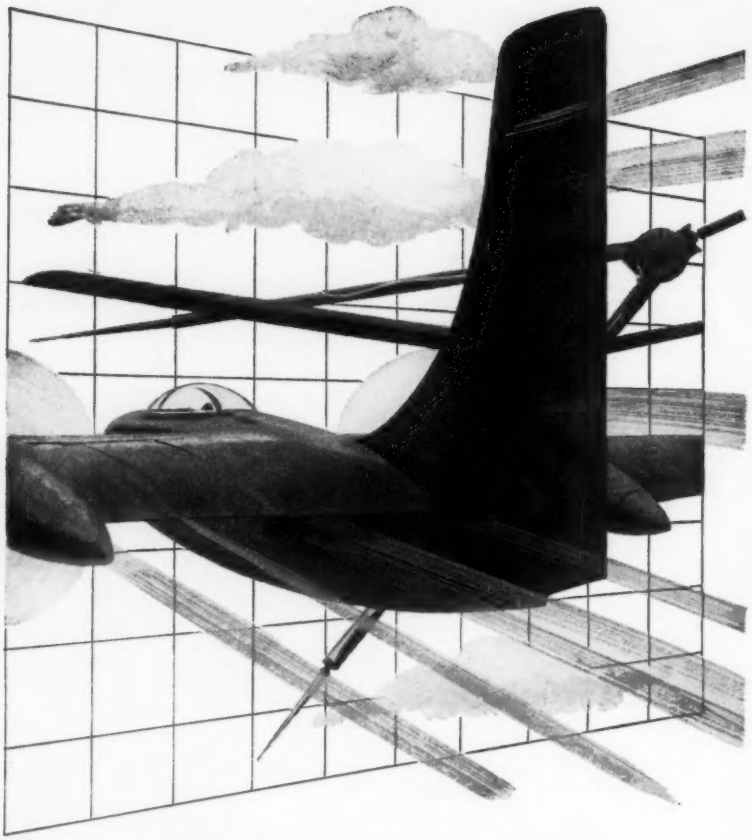

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ton's, who lives in India, had occasion to have some wiring done by a native electrician. He came to her over and over again for instructions. Finally in exasperation she said, "You know what I want. Why don't you just use your common sense and go ahead?" Whereupon he made a grave, courtly bow and said, "Madam, common sense is a rare gift of God. I have only a technical education."

It may be agreed that common sense is rare, but not that it is entirely a gift of God.

It is something which with great effort and tribulation can be developed. It grows out of experience and the proper blending of many skills and viewpoints. To the extent that those who work in the field of aeronautical science are able to so combine their talents, well-tempered aircraft in increasing numbers will be created and the great strength they can give to the free nations of the world will multiply.

Douglas Backlog Tops $1.335 Billion

With more than 10,000 production and maintenance workers returning to work after striking at Douglas Aircraft Co.'s Long Beach plant, President Donald W. Douglas found an additional note of cheer for the big West Coast aircraft builder's stockholders: backlog of unfilled orders exceeding $1.335 billion and sales totaling $153,371,814 for the nine months that ended Aug. 31, 1951.

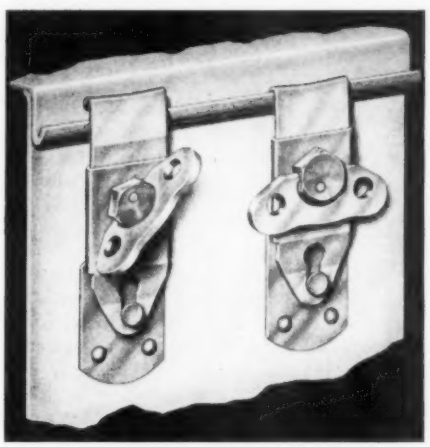
Net income came to $5,249,513, or $4.37 per share for the 1.2 million shares authorized, compared with $4,748,230 for the same period of fiscal 1950. Higher corporate tax rates caused percentage of net income to sales to drop to 3.42% from the 4.98% of last year's similar period.

Douglas warned the stockholders the cessation of C-124 Globemaster deliveries as a result of the work stoppage, which began Sept. 5, would cause a drop in the net sales figure for the final quarter.

The company's backlog, pinpointed at $1,335,634,863 as of Oct. 1, is broken down 89.5% military and 10.5% commercial business. In the latter category, firm orders for the DC-6A and B have reached 149. Total DC-6 orders exceed 320, exclusive of military models. Douglas working capital was $52,459,000, down $3,429,000 from the first nine months of 1950. Because of increased expenditures for fixed assets the company has arranged commercial loans up to $60 million at prime interest rates to finance its future commitments for production of aircraft for the Air Force, the Navy and the airlines.

Have you a similar fastening problem?

File: Simmons LINK-LOCK



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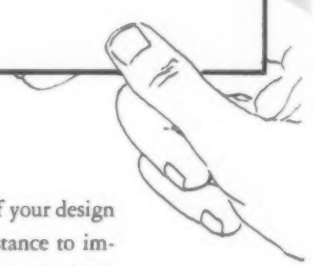

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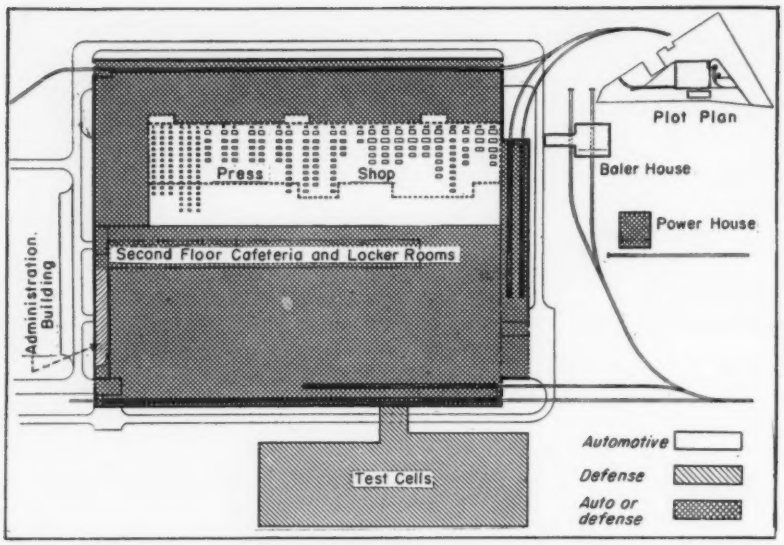

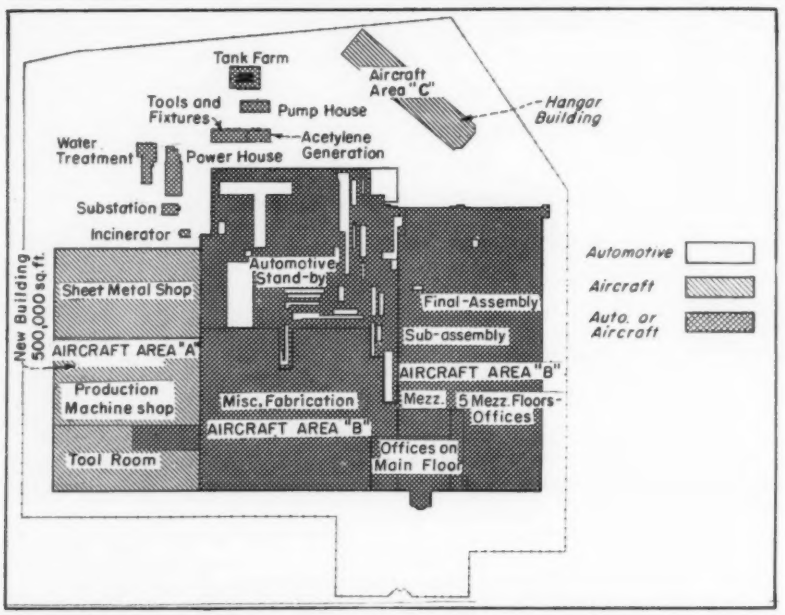

AIRPLANES OR AUTOS—or both—could be built in layouts, similar to those sketched here, which are being built by GM at Willow Springs, Ill., and Arlington, Tex.

GM Plans New Double-Duty Plants

Flexible set-up could plant auto makers more firmly in aviation, with quick shift possible from cars to planes.

By Alexander McSurely

General Motors Corp. is planning two prototype double-duty aircraft-auto plants embodying GM's recent proposal for factories which can combine civil and defense production or can concentrate on either type production as needed.

The new GM plant concept is being watched closely by the manufacturers who have heretofore constituted the permanent aviation industry. They look with mixed feelings at the enlistment of automotive companies and their huge mass production facilities into military aircraft production work in national emergencies.

▶ **Tough Competition**—The idea of such formidable competitors as General Motors establishing plants which could swing into building airplanes and aircraft engines on short notice means, to some aviation observers at least, that the automotive companies would be getting into the aviation business to stay. This would create a new set of competive factors which might have a permanent effect on the market for civil as well as military aircraft and powerplants.

At Willow Springs, Ill., just outside Chicago, GM's Buick-Oldsmobile-Pontiac division has just broken ground for a new 1-million-sq. ft. plant destined for assembly of British-designed J-65 Sapphire turbojets (rated at 7200-lb. thrust) under American license from Curtiss-Wright.

▶ **The First Step**—A week after he made his first speech in Cincinnati about the dual-purpose plant plan, GM President Charles E. Wilson disclosed that the Willow Springs unit will be such a plant, designed to be able to shift rapidly from jet engine production to automobile body stamping work and back to jet engines as requirements of the military and civilian production programs demand.

Shortly after Wilson's statement, Navy and General Motors announced that GM had received a letter contract to build a Grumman airplane, type not designated, at a newly acquired Arlington plant site in the Fort Worth-Dallas area, where 255 acres had been bought.

It had been unofficially reported that the plane would be the F9F jet fighter (AVIATION WEEK Sept. 17, p. 11). Later speculation was that the first plane would be a new version of the F9F, the more powerful, sweptwing F9F-6, possibly followed by the still untried F10F variable-wing fighter.

Navy announced plans to provide machine tools and related equipment and flight test facilities for military aircraft production at Arlington, but stated that this equipment would not be used for automobile production.

In first announcing his double-duty concept, Wilson disclosed two plant layout drawings, one showing how a plant could be used for production of jet engines and auto body stampings, and the other showing how a plant could be designed for airframe assembly and for automobile assembly. The drawings show the portions of each plant that would have to be special for one or the other purpose and portions that could be used for both production programs.

▶ **Double Action**—Offices, cafeterias, locker rooms, hospitals, powerplants, tool rooms, maintenance departments, railroad sidings and parking lots would be useful for either purpose, Wilson pointed out.

Space, construction and equipment for jet engine test stands, he stated, would be useful only for that purpose. Likewise the space, foundations and heavy presses for making large stampings would be useful only for auto-

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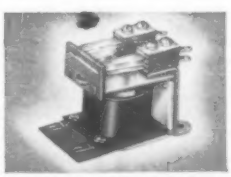

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mobile body production, and could not be put to use for jet engine manufacture. But much of the manufacturing space would be readily available for either production, and necessary light equipment and assembly fixtures for either, or both types of production side-by-side if necessary, could be moved in and out of these dual-purpose areas.

Specialized automotive equipment which could not be used in jet engine production could be stored in those parts of the plant not used for the engine program, and vice versa.

▶ **Pilot Lines**—During periods of limited defense production and as a part of the over-all plan, the manufacturer with a dual-purpose plant would have the obligation of maintaining pilot lines if requested. He would have to keep up to date on engineering and processing of the military production items planned for his plant in the event of larger military requirements.

Wilson pointed out that the Ford Willow Run bomber plant, the Dodge engine plant at Chicago, the Fisher bomber plant at Cleveland, the Curtiss-Wright plant at Columbus, the Buick aircraft engine plant near Chicago, and many other World War II war production plants reverted to the government at war's end.

He stated that there was no definite plan for the use of the plants, reemployment of the workers, nor recognition that such plants might again have to be used for production of military material.

▶ **Long-Term Pacts**—Wilson proposed that definite agreements and understandings be worked out by the government through its defense agencies with manufacturers building dual-purpose plants, to preserve the dual-operation feature for at least ten years, and for renewing such agreements "for several generations if necessary."

He called for a recognition in national policy that the manufacturing industry is a major element in a permanent national defense program and "must be prepared at all times to produce military equipment to latest specifications and designs and on short notice, in quantities to meet full war requirements."

He further asked legislation permitting long-term contracts between Defense Department and industry for custody and maintenance of special manufacturing facilities for war production, and to permit utilization of dual purpose plants and facilities, in the interest of continuing maximum production and stable employment.

Savings of time in meeting an emergency with dual purpose plants he stated, might well be more important than the other features of saving in cost or avoiding dislocation of employment.

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TEMCO T-35's At Goodfellow Air Force Base

TEMCO T-35 Buckaroos now are undergoing trainer evaluation at Goodfellow AFB. After several months of rugged service testing at San Marcos AFB, officers and instructors were in accord that the T-35 was truly a military aircraft. It has all the flight and performance characteristics of the big ships.

It proved to be an ideal basic intrument trainer because it has good stability, and due to its quick control response, the student can correlate movement of the controls with his instrument readings.

Another version of the T-35 Buckaroo has been equipped with two internally mounted 30-caliber wing machine guns and ten 2.75-inch rockets. It is being demonstrated as a light highly-maneuverable ground support aircraft. The machine guns are far more accurate than on many heavier aircraft because the guns are mounted on the torsional axis of the wing. The rocket installation is complete with intervalometer fire control, permitting the automatic firing of any single rocket, or any series of rockets in sequence.

C-54's Rolling Off Overhaul Line At Majors Field

TEMCO's overhaul operation at Majors Field, Greenville, Texas, is in full swing. This part of TEMCO's activity was recently moved from the main Dallas plant to make way for increased manufacturing operations at Dallas on four leading military aircraft.

TEMCO's overhaul activity has always been a big business. Since May, 1948, TEMCO has overhauled approximately 500 C-54's for the U. S. Air Force. Now with complete overhaul shops at Majors Field, C-54's are being flown in from bases in the United States as well as overseas and are rolling off the line with scheduled regularity after their cycle reconditioning.

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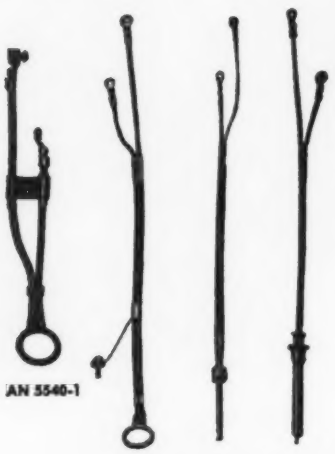

AN5540-2 AN5541-1 AN5545-1

AN5540-1 18 MM. iron-constantan Sparkplug-gasket type thermocouple for measuring cylinder-head temperatures. Also available in copper-constantan and in 14 MM size for either material.

AN5540-2 Iron Constantan Sparkplug-gasket type with copper ring for 18 MM plugs. Wire guard and supporting bracket are stainless steel and conductors are protected with flexible heat-resistant sleeving. AN5539 terminals are silver-soldered to leads.

AN5541-1 Iron Constantan Bayonet Type thermocouple with junction located in silver tip. Spring used with this thermocouple will retain its strength despite high temperatures.

AN5545-1 Chromel-Alumel Tailpipe Thermocouple. Insulated with a temperature-resistant ceramic and overbraided with stainless steel wire, this thermocouple is built to withstand severe jet engine service.

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AVIONICS

RESIN PATCH is applied to damaged F3D radome in Navy's newest bid to cut repair costs. Stones tossed up on runways are frequent damage cause.

New Resin Repair For Radomes

Navy technique will result in salvage of plastic housings which formerly were discarded as useless.

Repair techniques have been perfected that will shunt radomes headed for the discard pile back into service life.

Salvage of these avionic housings eventually will save hundreds of thousands of dollars yearly for the Navy Bureau of Aeronautics' maintenance division, for whom the repair methods have been developed. Thus, at the Norfolk Naval Air Station alone, it has been found that an average of 1½ radomes valued at from $3,000-$5,000 each had been discarded each week through former inability to make repairs.

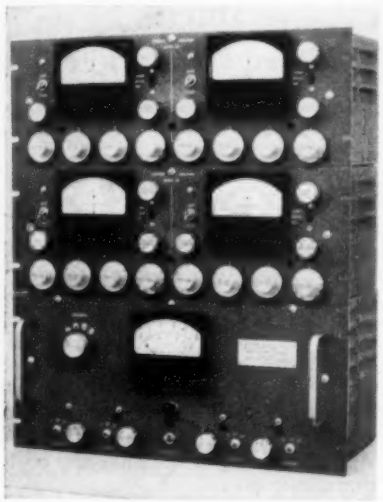
▶ **"Contact" Resins**—The new techniques were perfected at the Naval Air Development Center's aviation electronics and electrical laboratory in Johnsville, Pa. Utilized are a relatively new class of materials—"low pressure" or "contact resins"—syrupy liquids usually of the alkyd or polyester class.

Mixed with catalysts, these resins change their physical form, through the process of polymerization, from a liquid to an infusible solid. This property renders them suitable for preparing laminates and other constructions for which complex shapes would otherwise involve the use of elaborate and expensive molds. With the contact resins, the mold may be of plaster, wood, metal or glass fabric laminates, and since only contact pressure is required, large presses are not needed and cost is held to a minimum.

▶ **Training Phase**—Because BuAer is aiming at salvage of a major portion of damaged radomes, it has taken steps to

REPAIRED joint on P2V2 wing tip radome at NADC, Johnsville, Pa.

insure that personnel will be available for the specialized work on these critical avionic components. NADC's aviation electronics and electrical lab, in conjunction with BuAer's maintenance division, has set up a training program in repair procedures. Technicians from five Naval air stations and a Marine Corps air station have taken the course of instruction—resin chemistry, methods of impregnation, molding techniques, basic electronic theory as applied to radomes, and effects of patching on properties.



Carrier Amplifier Is New Laboratory Tool

A new laboratory carrier amplifier, designed for low-level measurements from transducers, is offered by Electronic Engineering Associates, Ltd., 1026 Brittan Ave., San Carlos, Calif.

The amplifier is intended for engineering dynamic investigations of stress, strain, pressure, displacement, velocity and other such factors.

Design of the amplifier combines high gain with low noise. Operating stability is achieved under adverse conditions of local electrical disturbance, as well as under temperature and humidity variations.

The equipment is housed in units which can be either mounted in standard 19-in. racks or bench-stacked. One power supply (lower cabinet) will energize one or two 2-channel bandpass amplifiers (upper cabinets). Transducer inputs are brought to bridge circuits which are convertible for 1-, 2- and 4-legged configurations.

Output frequency range for dynamic measurements is 0 to 500 cycles. Ambient temperature range is −26F to 122F. Operating power is 115v. at 220va. for 4-channel operation.

A single 4-channel unit plus power supply cost $2,100.

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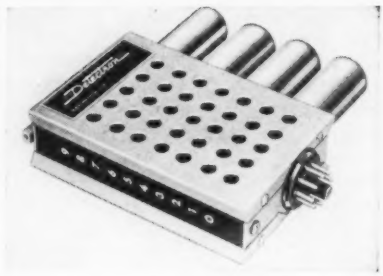


Electronic Totalizer Counts 100,000 Cps.

High-rate counting as rapidly as 100,000 cps., is the feature of two new models of the Detectron electronic totalizer obtainable from Stratex Instrument Co.

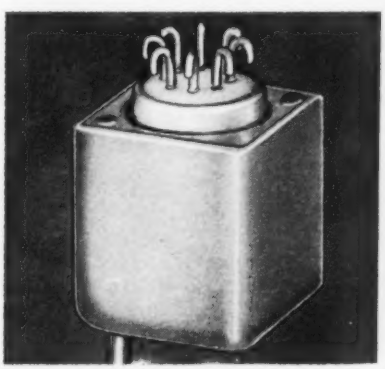
Model TU-9 records impulses up to 30,000 cps.; model TU-10 extends the counting range to 100,000 cps. Both units weigh only 10 oz., are 1¼ in. by 5 in. by 5¼ in.

Both units have octal base plugs for individual or series mounting. Power supply is 200-400 v. DC at 12 milliamps., with an input-output pulse of 100 v. negative.

Tubes and circuits are shielded in aluminum alloy.

The units can be cascaded; and resetting is external and instant.

Literature, price and discount information is available from the manufacturer, Stratex Instrument Co., 1861 Hillhurst Ave., Los Angeles 27.

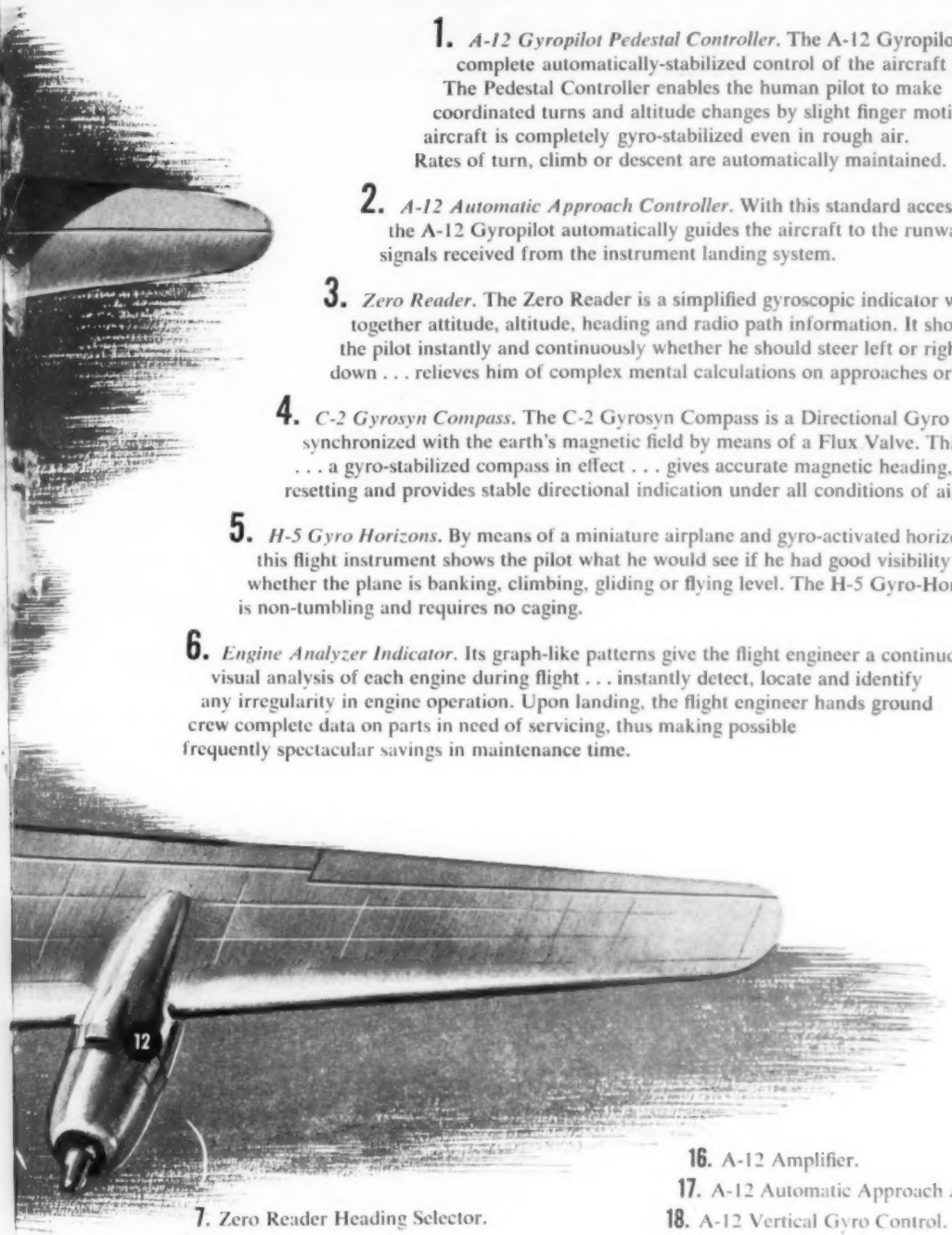


New Relay Design

Another miniature, hermetically sealed relay is being offered by the Hermaseal Co., Inc., Elkhart, Ind. Hermaseal developed the relay in conjunction with the North Electric Manufacturing Co of Galion, Ohio.

The relay has an eight-terminal hermetically sealed header 0.6 in. dia. and a new design, balanced armature relay sealed in a drawn aluminum cube.

The unit may be panel mounted from either top or bottom. It can be furnished either with a dry air fill or pressure-filled with dry nitrogen.



1. *A-12 Gyropilot Pedestal Controller.* The A-12 Gyropilot provides complete automatically-stabilized control of the aircraft through all weather. The Pedestal Controller enables the human pilot to make coordinated turns and altitude changes by slight finger motion while the aircraft is completely gyro-stabilized even in rough air. Rates of turn, climb or descent are automatically maintained.

2. *A-12 Automatic Approach Controller.* With this standard accessory the A-12 Gyropilot automatically guides the aircraft to the runway with signals received from the instrument landing system.

3. *Zero Reader.* The Zero Reader is a simplified gyroscopic indicator which pieces together attitude, altitude, heading and radio path information. It shows the pilot instantly and continuously whether he should steer left or right, or go up or down . . . relieves him of complex mental calculations on approaches or landings.

4. *C-2 Gyrosyn Compass.* The C-2 Gyrosyn Compass is a Directional Gyro synchronized with the earth's magnetic field by means of a Flux Valve. This instrument . . . a gyro-stabilized compass in effect . . . gives accurate magnetic heading, requires no resetting and provides stable directional indication under all conditions of air turbulence.

5. *H-5 Gyro Horizons.* By means of a miniature airplane and gyro-activated horizon bar, this flight instrument shows the pilot what he would see if he had good visibility outside—whether the plane is banking, climbing, gliding or flying level. The H-5 Gyro-Horizon is non-tumbling and requires no caging.

6. *Engine Analyzer Indicator.* Its graph-like patterns give the flight engineer a continuous visual analysis of each engine during flight . . . instantly detect, locate and identify any irregularity in engine operation. Upon landing, the flight engineer hands ground crew complete data on parts in need of servicing, thus making possible frequently spectacular savings in maintenance time.

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8. Zero Reader Selector Switch.
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10. C-2 Gyrosyn Compass Amplifier.
11. C-2 Gyrosyn Compass Flux Valve.
12. Engine Analyzer Synchronizing Generators.
13. Engine Analyzer Cycle Switch.
14. Engine Analyzer Condition Switch.
15. Engine Analyzer Power Supply-Amplifier.
16. A-12 Amplifier.
17. A-12 Automatic Approach Amplifier.
18. A-12 Vertical Gyro Control.
19. A-12 Gyrosyn Compass Control.
20. A-12 Pilot Engaging Control.
21. A-12 Servo Control.
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26. A-12 Flux Valve.

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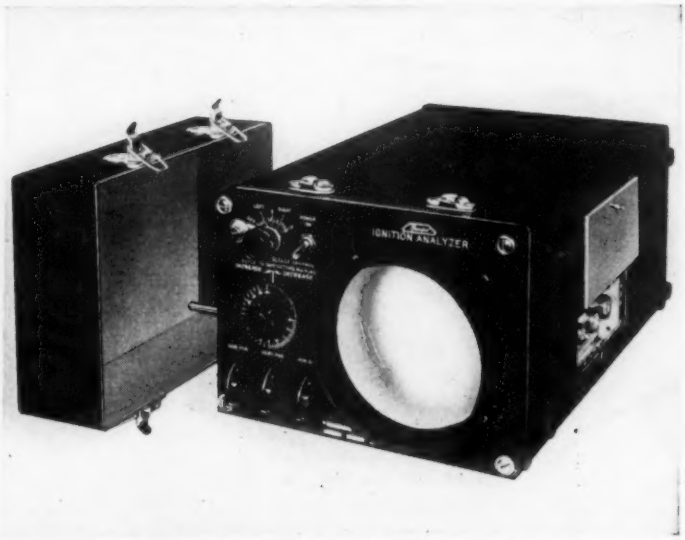


SCINTILLA portable analyzer which can be airborne. Both win favor.

Plug Refinements Up Engine Reliability

• Champion conference is shown latest improvements and also hears debate on portable analyzers.

• Use of hexagon steel stock and new methods of making gaskets saves tons of critical materials.

(This is the second and concluding report on the recent Aircraft Spark Plug and Ignition Conference sponsored by Champion Spark Plug Co., Toledo.)

By George L. Christian

Toledo—The spotlight of the recent Aircraft Spark Plug and Ignition Conference here was on:

- How to improve spark plugs.
- How to save critical materials in making spark plugs.
- The competition between Sperry and Scintilla in the field of aircraft engine and ignition analyzers.

Spark Plugs

R. K. Christie, Champion's director of research, said there were many theories on how to improve a plug—most of them mutually contradictory.

Should the insulator nose be long or short? Plug shells large or small? Electrode dimensions fine or massive? Gap dimensions narrow or wide? Should provision for Venturi effects be incorporated in plug nose design? These are a few of the problems which must be resolved.

► **Thermo-Tools**—Tools have been developed to probe the problems of improving spark plug design. Two used by Champion are the thermocouple plug and the Thermoelectrometer, popularly known as "Oscar" (AVIATION WEEK Sept. 18, 1950, p 19).

• **The thermocouple plug** (which incorporates thermocouples at critical hot spots such as center electrode, nose insulator, etc.) is currently being evaluated on the B-36's R-4360 engines, according to Christie, but Champion has not yet had time to evaluate the results. The device is one of the handiest tools engineers have devised to solve spark plug heat troubles.

• **The Thermoelectrometer,** unveiled at last year's conference, has aroused so much interest in its first year of existence that Champion offered to make it available to the industry if demand warranted, although, as Christie stated, "We are spark plug manufacturers, not gimmick makers."

Oscar would probably come in very handy as a training aid, since its function is to predict insulator nose and center electrode temperatures under the seven variables of engine operation: fuel/air ratio; cylinder head temperatures; inlet air temperature; spark advance; rpm.; manifold pressure; and exhaust back pressure.

► **New Plugs**—Champion rolled out a show case exhibiting sectioned views of its five latest spark plugs, part of 13 experimental plugs now approved.

• **R37S-1E.** Features: glass center electrode seal; threaded terminal. Will supercede the R37S-1D.

Status: Approved by engine manufacturers and military services.

• **R56S.** Features: colder plug having 1/16-in. shorter insulator nose; has glass center electrode seal; threaded terminal.

Status: Approved by WAC for the R-3350-30W compound engine.

• **R33S.** Features: colder than the R56S; has a 5/32-in. shorter insulator nose than R37S-1E; incorporates glass center electrode seal; threaded terminal.

Status: Approved by WAC for the R-3350-30WA compound engine.

• **R115.** Features: high altitude barrel construction incorporating the ¾"-20 elbow; glass center electrode seal; threaded terminal. (It is high altitude counterpart of the R37S-1.)

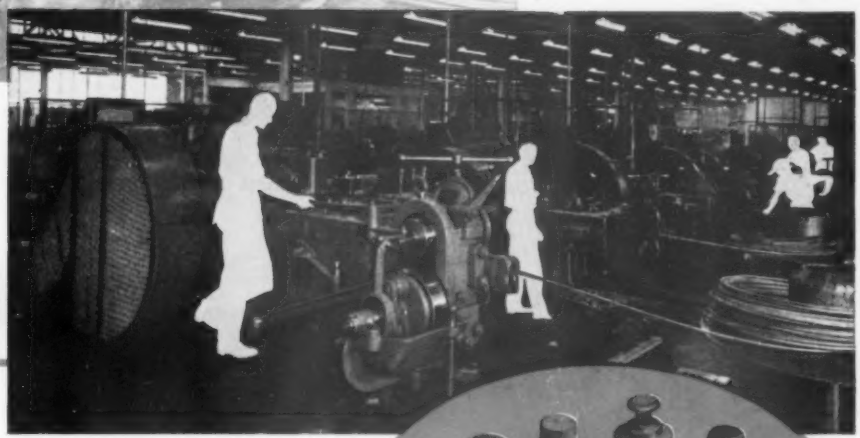
Status: Approved by WAC on the R-1820-82. On test by AMC and Carswell AFB on the R-4360.

• **R103.** Features: high altitude barrel construction; has ⅝-in. shorter insulator nose than R37S-1E; incorporates glass center electrode seal; threaded terminal. (Is high altitude counterpart of the R33S.)

Status: Approved by WAC for 972-

the Skill

the Facilities



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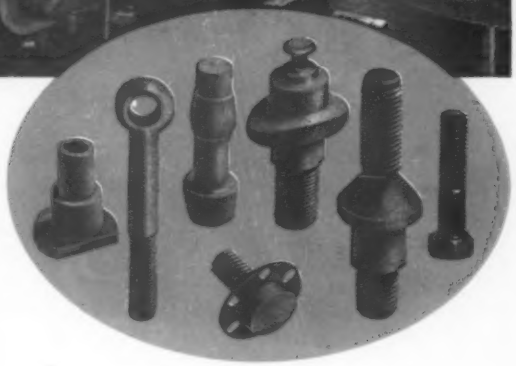
At all of the Allied plants — in every department — is the *right* combination of skill and facilities. It's worth remembering when you are looking for a dependable source for the types of products manufactured by Allied.



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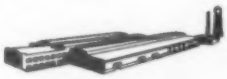
Detroit, Mich.

PLANT 2
Detroit, Mich.

PLANT 3
Hillsdale, Mich.



PLANT 4
Hillsdale, Mich.

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RG CABLES produced by Amphenol are backed by years of manufacturing experience. The majority utilize polyethylene which possesses exceptional dielectric properties — low loss, flexibility, mechanical stability. Teflon dielectric, developed for the needs of jet aircraft and guided missiles, is used in others designed to operate efficiently up to 500° F.
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—D2
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TC18 DA1 (R-3350 compound engine for the 1049C Super Constellation); 975-C18-CA1 (R-3350 compound engine for the 1049B Super Constellation); R-3350-85 compound engine.

Also shown was the R214 plug, incorporating a high altitude barrel, platinum fine wire electrodes and closed nose insert construction, glass center electrode seal and threaded terminals. Christie said that the plug, although experimental at the moment, gave excellent electrode life and was unusually free from nose core failure. Model tests on the R-4360 are complete and it is currently being tested by AMC and USAF in this engine.

▶**Saving Steel & Copper**—Howard Vogel, Champion's chief engineer, cited these highlights of his firm's efforts to save critical materials, primarily steel and copper.

Champion makes twice the copper plug gaskets from the same weight of material as before by cutting them from .038-in. sheet instead of .080, folding them in the shape of an "S" then compressing the whole unit. The company can save 15,000 lb. of copper per 1,000,000 gaskets manufactured.

The new gasket has no top or bottom and positions the plug within .001 in. of the same location as when the solid gasket was used. Heat dissipation characteristics of both gaskets are essentially the same.

Champion also has a steel-saving scheme up its sleeve, according to Vogel. The plan, under consideration by USAF, Navy and engine manufacturers, is to make plugs out of $\frac{7}{8}$-in. hexangular stock. Eliminating milling the $\frac{7}{8}$-in. hex on current style plugs would save $57\frac{3}{4}$ tons of steel per 1,000,000 plugs, Vogel pointed out.

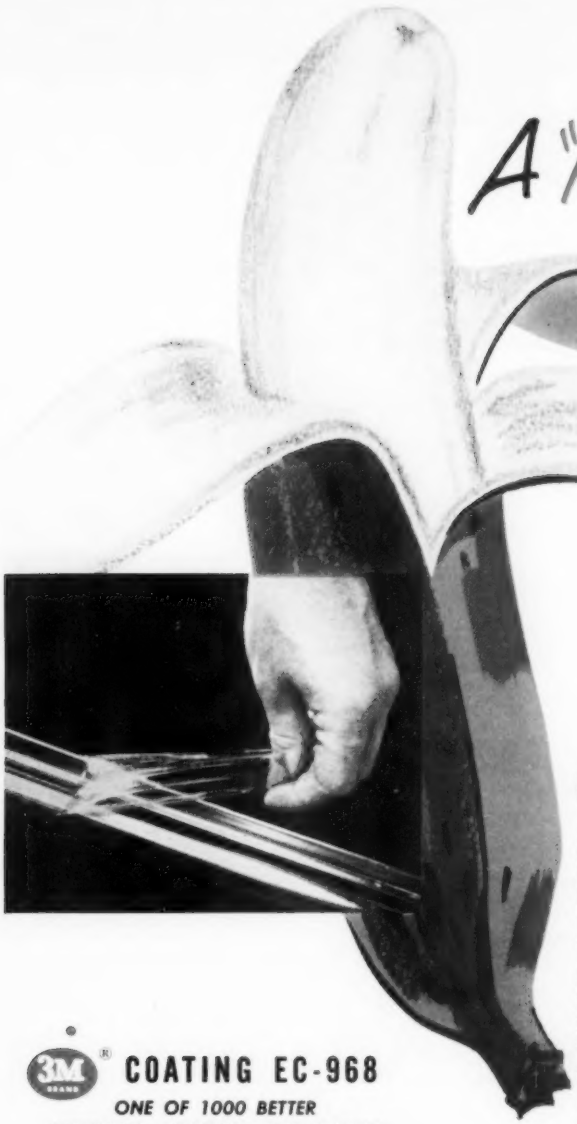
▶**R37S-1Ds & -Es**—Champion engineers outlined the production status of the glass center electrode seal R37S-1E plug, 60,000-70,000 of which have been made in the last 12 months.

Problem is need for a production type furnace to fire the glass seal. This is being solved and Champion anticipates a production rate of 10,000 a day within six weeks. D and E versions of the plug will be manufactured and shipped simultaneously until the supply of D parts is used up.

The length of the E plug from gasket seat top of plug has been shortened on the E to standardize its dimensions with other plugs.

▶**Proper Plug Packaging**—Some of Champion's plugs are being packaged in a new manner. The old style tube package is giving way to a 50-plug carton with cardboard dividers to separate the plugs. Advantages claimed are easier disposal of unneeded packaging and more-than-50% reduction in cost (60¢ vs. $1.50). Champion asked for opinions on the new package and Fast-

A "natural" for protection



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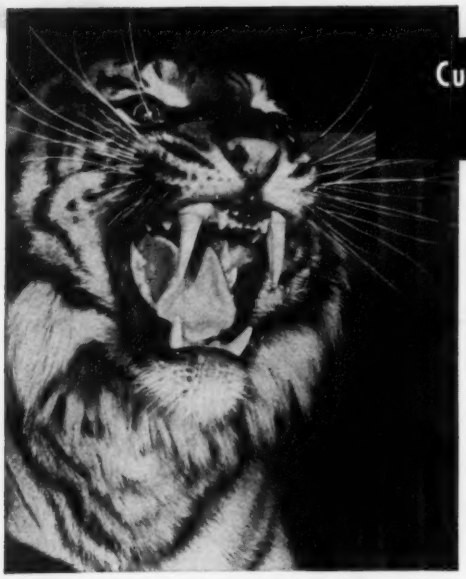

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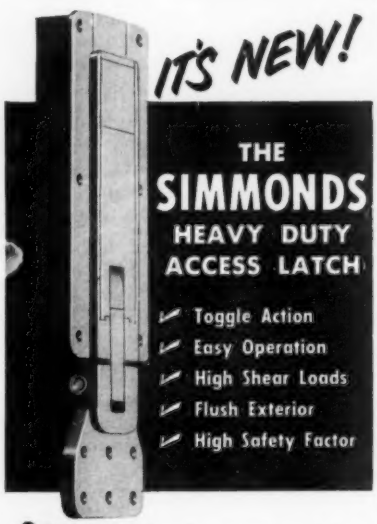

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ern Air Lines came out strongly in favor of it.

► **Plug Talk**—Champion is still experimenting with a plug (the R314) embodying a ceramic of much higher thermal conductivity than now used. No data are yet available.

• **High altitude** ¾"-20 spark plug connectors in R-4360 engines have given very measurable improvement of ignition performance, according to the USAF which has the installation on B-36s. A USAF representative stated that "the engines exhibited a far-greater tolerance to plug malfunction and larger spark gap."

Unscheduled removal rates dropped from 50 per 1,000 engine hours when reconditioned plugs were used, to 25 when new plugs were installed, to 10 when the ¾"-20 connector came into use, USAF indicated.

Champion said any price increase resulting from the ¾"-20 installation would be minor.

Scintilla spoke favorably of high altitude terminals, stating that they had advantages even when used at low altitudes—reducing moisture problems and electrical leakage.

• **Polarity of plug** electrodes used with Scintilla high tension ignition systems on R-2800 and R-3350 engines does not change. On the Scintilla low tension system, polarity alternates with each firing, evening out the effects of erosion and reducing it below the rates existing with high tension ignition.

• **Base IMEP ratings** for Champion plugs are: R37S-1, 300; R56S, 350; R33S, 430; R115, 300; R103, 430; R214, 400.

• **Anti-fouling plug** was introduced to the meeting by Boeing's representative, Ken Gordon, who stated that the plug had gone through single cylinder engine tests and was currently undergoing evaluation by P&WA in an R-4360. The plug has a novel Venturi-shaped "pre-combustion" chamber housing the electrodes inside which the mixture is fired (AVIATION WEEK Oct. 15, p. 48).

Analyzers

► **Analyzing Analyzers**—Operational refinements of Aircraft engine and ignition analyzers are marching forward with large strides, and the units are gaining greater acceptance, according to manufacturers Sperry Gyroscope Co., and Scintilla Magneto division of Bendix Aviation Corp.

J. W. Wheeler, in charge of engine instruments at Sperry's engineering department, outlined the progress made with the engine analyzer in the last year.

Sperry's analyzers have been applied to 400-cycle transformer- or vibrator-type jet engine ignition systems and easily show up malfunctions such as

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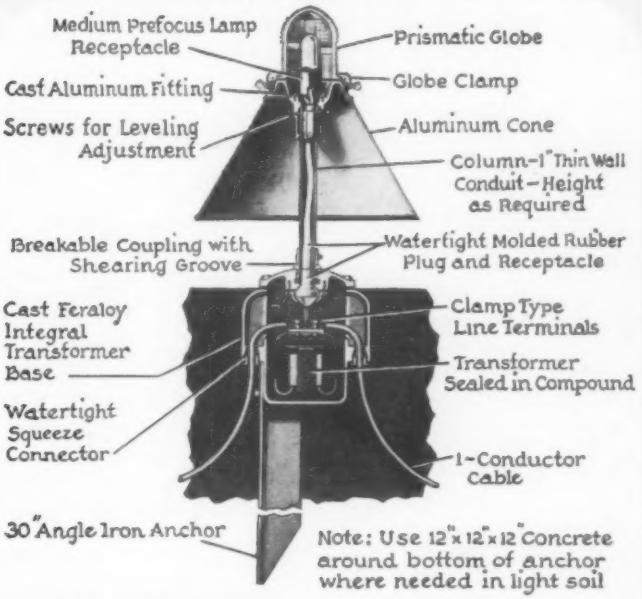
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Style A Mounting consists of surface flange and 30-inch anchor stake, with a direct earth burial type transformer. This provides the simplest and most economical installation.

Style B Mounting is illustrated in the assembled view at the left. It consists of a base plate and gasket to fit transformer base housings. It is used for converting existing flush marker light fixtures to ERL fixtures or for new installations at large airports or wherever a first-class wiring installation is desired. This mounting provides maximum accessibility of the transformers and connections and will save considerable time in case of wiring difficulties.

Style C Mounting is for multiple circuits and consists of a junction box with a hub cover on top, two squeeze connectors for through-feed cables at the bottom, and a 30-inch angle iron anchor. This mounting is especially useful for short runways and for taxiway lighting.

Style D Mounting, as illustrated above, consists of an integral cast Feraloy base housing and transformer complete with anchor stake. This transformer base in furnished in both series type (for 6.6-ampere circuit) and multiple type (for 600-volt multiple circuit).

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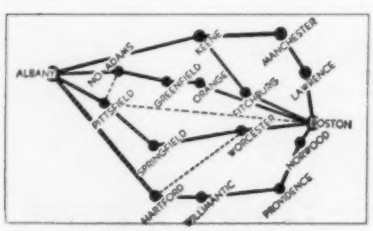

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open or shorted secondary circuits.

Patterns have also been successfully established for low tension and resistor cable ignition systems, and combustion cabin heaters.

Wheeler emphasized the value of the vibration pick-up feature of the instrument. This feature enables the operator to determine valve clearances under actual, dynamic conditions, rather than under static, cold clearance. It is this actual operating clearance that is of primary importance as far as satisfactory valve and engine performance is concerned, Wheeler stressed.

New features of the Sperry unit are:

• **Crankshaft timing maker**—Accurate to less than one crankshaft degree, according to Sperry. But further redesign and service testing may be necessary to increase its reliability. The device consists of a variable reluctance pick-up and a small vane attached to and rotating with the tailshaft.

Sperry felt that such a device was necessary because synchronizing generators driven off the accessory section are subject to errors of initial accuracy of the gear train, tolerances of shafting and bearings, wear, and windup caused by torsional vibration. Moreover, generally speaking, large aircraft engines are the only reciprocating engines having no index for determining dynamic or static crankshaft position.

• **Torque rate pick-up**—Adapted from a modified Sperry vibration pick-up, this sensing element feels the rate of change in engine torque and responds electrically. Installation must be close to the torque cylinder where it adequately registers even very high frequency transient pressures. Unit is now undergoing service evaluation with promising results in several aircraft, Sperry says.

▶ **Portable Analyzer**—Sperry plunged deeper into the simmering analyzer competition with a new portable instrument. Scintilla countered this invasion of its bailiwick by offering its analyzer as an airborne installation as well as a portable unit, striking at Sperry's stronghold.

Sperry listed these improvements for its portable unit:

• **Timing can be performed** at the analyzer because an electrical phase shift at the unit was substituted for a mechanical shift of the stator of the synchronizing generator. This permits installation of the synchronizing generator without regard to phasing. An ignition pulse pick-up is provided for small aircraft on which sync generators are not installed.

• **Checking of engines** with any number of cylinders, from one up, may be done with the Sperry instrument simply by installing the dial plate corresponding to the engine's firing order and number of cylinders. It also permits checking the number of crankshaft degrees between any two engine events.

• **Testing facilities** without external relays have been provided for high or low tension ignition systems on the R-4360.

• **Frequency variation of** supply line to the analyzer is permissible from 50 to 500 cps.

• **Analyzer may be tilted** by adjustable legs; front cover serves as a writing table when open.

Price of the unit has been reduced approximately $1,000 to around $2,200. This is still more than double the cost of the Scintilla portable analyzer.

(*Continued on p. 61*)

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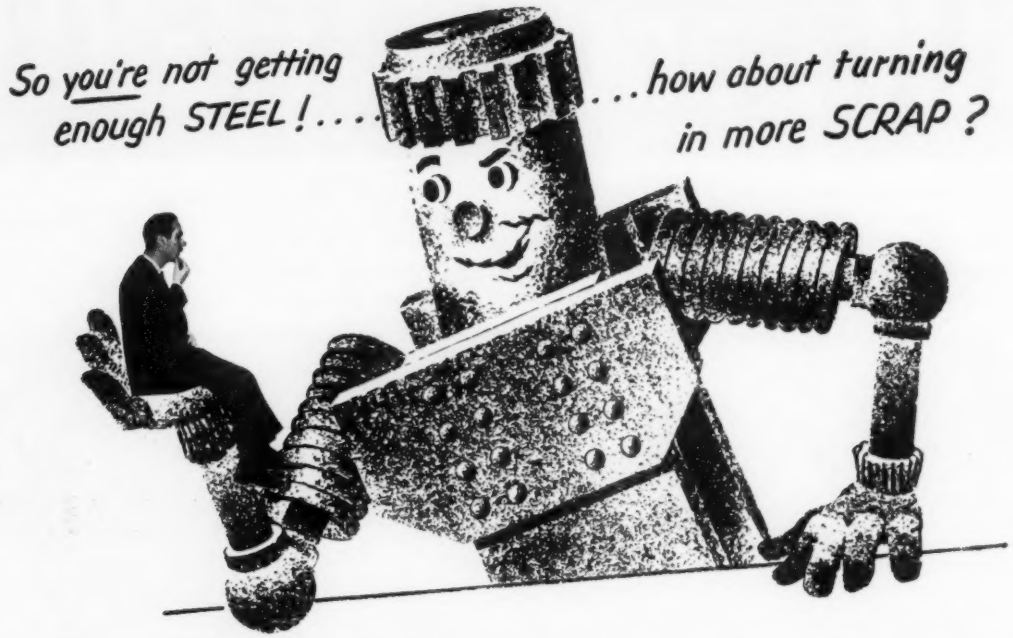

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1902-A

UNITED STATES STEEL

(*Continued from page 57*)

▶**Scintilla Story**—Clayton Welch, Scintilla's chief sales engineer, while admitting that the results obtainable with either analyzer should be essentially the same, pointed out that the approach to the problem of ignition analysis by the two companies was different. He supported his company's analyzer philosophy on these three pillars:

• **Economy.** The Scintilla instrument costs about $800, the Sperry portable about $2,200.

• **Versatility.** Scintilla's portable airborne and ground portable analyzers are one unit, which can be used on any type of engine. An airline wanting to equip part of its fleet with one type and the rest with the other, would have only one basic analyzer to buy.

• **Load control.** This exclusive Scintilla feature enables an operator to reduce current flowing to the spark plugs gradually until the weakest plugs stop firing. Welch emphasized the utility of such a control, pointing out that it can increase plug removal time by locating the first plugs to fail. The remainder may be left in for additional service.

Sperry questioned the usefulness of load control, stating that it was an additional expense and was a burden on the operator since it required him to run an additional check. Sperry said that the first indication picked up by load control's voltage reduction is a wide gap which is not necessarily harmful. Next indication is a fouled plug, but this shows up in the pattern on the scope anyway so, Wheeler reasons, load control is not worth the trouble or cost of installation.

▶**Breaker Synchronizer**—Welch said that the single lobe cam, ½-engine speed, aircraft type breaker Scintilla installs on the engine to time its analyzer to the crankshaft is a good and reliable piece of equipment. Six breakers having 600-700 hr. service life on them have given no indication of timing change, he said, while lab test units with 1,500-2,000 hr. show very little variation. Welch backed up his statement with the observation that timing changes on aircraft magnet breaker assemblies with multi-lobe cams were very slight with use, possibly 2-3 deg. He conceded that back lash in the tachometer generator drive gear train used to power the breaker is a problem.

▶**Cogent Comments**—Trans-Canada Air Lines came up with some cogent comments about analyzers in general and about load control in particular. R. W. Farren, TCA engineer, came out flatly in favor of load control. He stated that in preliminary tests the system had isolated marginal magnetoes and plugs which subsequent tests confirmed to be weak units.

• Farren pointed out that TCA is probably the first airline to equip all its planes to use analyzers. All TCA's aircraft, including the venerable DC-3, are being wired to accommodate a portable Scintilla unit. Not having a flight engineer, an airborne installation would not be practical.

Farren stressed that TCA "saw clearly the tremendous gain to be achieved with analyzers . . . but it was hard to convince the 'higher-ups'."

These factors convinced TCA that analyzers were for them:

• **Ignition** was the culprit which gave the greatest number of delays, proportionately speaking.

• **Ignition delays** were almost invariably long delays, often running into hours.

• **Ignition gremlins** caused an extremely high rate of unnecessary removals. Example: 45% of all mags and 92% of all spark plugs were removed without reason.

TCA feels that if the analyzer will allow line people to say "It's the mag that's bad"—or the plug, and which plug, the analyzer is justified "It's just as simple as that," Farren said. He does not envision line mechanics going into deep theoretical analysis of the trouble at hand.

Farren said all items fingered by the

NEWS Edo NOTES

AIRBORNE RADAR FLIES IN EDO-BUILT NACELLES

That's not a bomb on this latest carrier-based Navy attack bomber—the Douglas AD-4(Q)—it's airborne radar housed in a streamlined aluminum nacelle built by skilled craftsmen at Edo. Hundreds of these airborne radar nacelles have been built at Edo's College Point plant where more than a quarter of a century ago the first all-aluminum seaplane floats were built.

The Edo Corporation's twenty-six years of precision metal-working know-how are being put to good use on a wide variety of aircraft components ranging from seaplane floats for commercial seaplanes to fins and rudders for the Republic F-84 Thunderjet fighter.

Edo has also come to be known as a leader in the field of echo-sounding electronic equipment for large naval vessels and is a prime supplier of the latest sonar equipments of far greater range and accuracy than has been previously possible. Because of Edo's intimate knowledge of both marine and aviation fields, significant improvements in ruggedization and miniaturization have been incorporated into this increasingly important electronic equipment.

Edo CORPORATION
COLLEGE POINT, NEW YORK

analyzer for removal will be specially identified and examined by experts.

► **Rugged & Simple**—TCA feels that its analyzers have the two prime attributes of ruggedness and simplicity. It hopes only to break even on the installation and will be perfectly content if the unit does nothing more than eliminate the annoying ignition delays. And TCA believes as a preventive maintenance tool the analyzer is without peer.

But the airline issued a word of warning. Before the novelty of the instrument wears off, personnel are likely to do too much "witch hunting," which is time-consuming and costly. Best remedy is thorough training and indoctrination of operators.

► **They Pay off**—Pan American World Airways heartily supported the belief that analyzers pay off. Experience with some 80 Sperry instruments indicates that they will pay for themselves in a matter of months. PAA engineers suggested that the airborne analyzer installed on its Boeing Stratocruisers saved $20,000 per aircraft per year—the cost of several analyzer instruments. PAA also emphasized the preventive maintenance advantages offered by analyzers and that airborne instruments enable flight engineers to obtain and maintain proper operating techniques and norms.

The analyzers have markedly reduced the number of engine component changes, previously made in a "hit-or-miss" manner.

► **Spotting Pre-Ignition**—PanAm representatives said that they had tried to detect pre-ignition with the analyzer and had found it practical. Pre-ignition occurs so rarely that PAA has no mass of data on the subject.

Sperry engineers thought pre-ignition is indicated by the analyzer 5-10 min. before destructive results occur. PAA flight engineers scan the engine about every 20 min.

Welch of Scintilla offered a different idea. He agreed that the pre-ignition flame front is conductive but doubted that the spark plug could be shorted by it for any appreciable length of time.

Scintilla tests indicated only slight pattern changes when pre-ignition occured. These tests did show that if pre-ignition was allowed to occur continuously, the pattern on the scope would finally show a completely shorted plug. This pattern would remain after pre-ignition was removed and returned to normal only as cylinder head temperatures dropped.

Conclusion was that the short was due to excessive temperatures rather than flame front shorting the plug. This means analyzers cannot always indicate definitely that pre-ignition exists, according to Welch.

Sperry and Scintilla agreed that spark plugs with cracked nose ceramic, but still sparking, are hard to pick up until there is a change of pattern on the scope. Sperry announced that it had 130 units installed on 20 to 25 different types of aircraft distributed among 12 airlines, exclusive of military installations. Scintilla claimed installations with 49 customers so far, also excluding military commitments.

► **Low Tension Ignition**—Consensus of opinion among engineers and maintenance people at the conference was that low tension did greatly improve ignition system performance and reliability. Paul Kovac of American Airlines cited these specific figures as improvements due to low tension installation:

	DC-6	Convair 240
Ignition delay reduction	21%	25%
Premature plug removal reduction	43	40
All ignition component replacement reduction	35	26

Major complaints of low tension centered around collector plates burning and pitting, "Y" leads breaking. Scintilla said it was aware of these deficien-

small

simple

LEAKPROOF

Westinghouse "AP" TYPE

Pneumatic Check Valves

Disc-type construction permits flow of air in pipe lines in one direction only. Particularly applicable where there is a rapid, almost incessant, operation of the valve. Compact, simple, leakproof design; meets the rigid requirements of USAF for the 1500 psi class pneumatic service.

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7 Available in ¼" and ⅜" tube size

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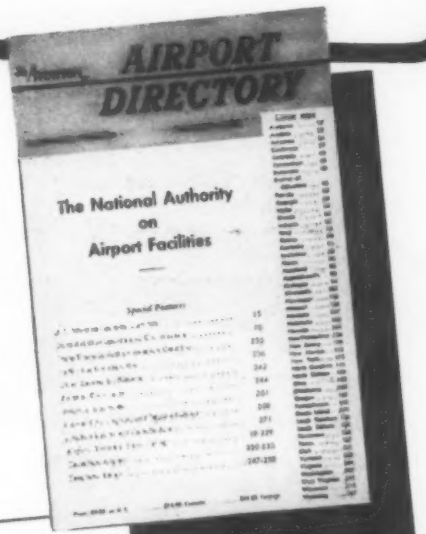

1951 Aviation Week

AIRPORT DIRECTORY

Whether you wish to check runway lengths at your neighboring airfield, or need reliable data on aeronautical identification symbols, having this authoritative guide on hand means every answer at your fingertips. Now under the editorship of the staff of Aviation Week, a number of changes have been made in the 1951 Directory—changes designed to make this edition of increasing usefulness. It is rearranged for faster, easier reference, made smaller in size for convenience in handling, checked and double-checked to insure that the latest possible information is used. You'll want to keep a copy of this recognized authority on airport facilities close at hand. Why not fill out and mail the coupon below today—while the matter is still fresh in your mind.

Here's what a typical airport listing gives you:

- Name of airport
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- Directions of runways
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- Size of Hangers
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- Teletype facilities
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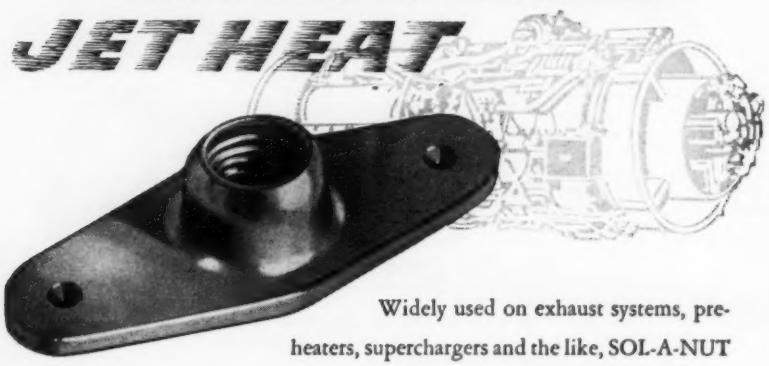

Widely used on exhaust systems, preheaters, superchargers and the like, SOL-A-NUT has proven its stamina on jet engines, too. Sturdy, one-piece stainless steel construction assures long life . . . no corrosion if nicked or scratched. Reasonable in cost, quick and easy to spot-weld, SOL-A-NUT cuts assembly time in both manufacturing and maintenance operations.

Monadnock, with a wealth of fastening experience, also has reliable development and production facilities available to manufacturers of quality products.

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cies and was actively engaged in correcting them.

Here & There

NWA, pioneer experimenter with Packard's resistance spark plug cable, the so-called "wireless wire," said it had equipped an R-4360 engine with it to check analyzer operation.

Result was a definite effect on the pattern, but the analyzer remained perfectly useable.

NWA is now considering the effects of cold weather on the cable. Airlines indicating they would test the cable were National, PanAm and Trans-Canada.

Free-wire high tension leads covered with Titeflex for low tension systems on R-3350BD engines using 5mm. cable are giving excellent results at EAL. And they are cheap.

If distributor insulator bowls are removed from the Scintilla D4RN-2 magneto, flashover altitude (at 10,000 v.) will drop from 31,000 ft. to 22,000 ft., according to the maker. Their removal is not recommended.

Scintilla is working on, and believes it has the answer to, the problem of making a mag breaker point which can be changed in the field without affecting the dwell point.

Answer may be an elongated fastening screw hole to permit holding close dimensions between center line of a fastening screw and center line of cam follower.

Champion's Burns Maus, himself the spark plug of the conference, kept the meetings moving along with split-second timing. Many comments were overheard that this was the best of seven excellent conferences conducted by Champion.

Bendix Gets RAAF Equipment Contract

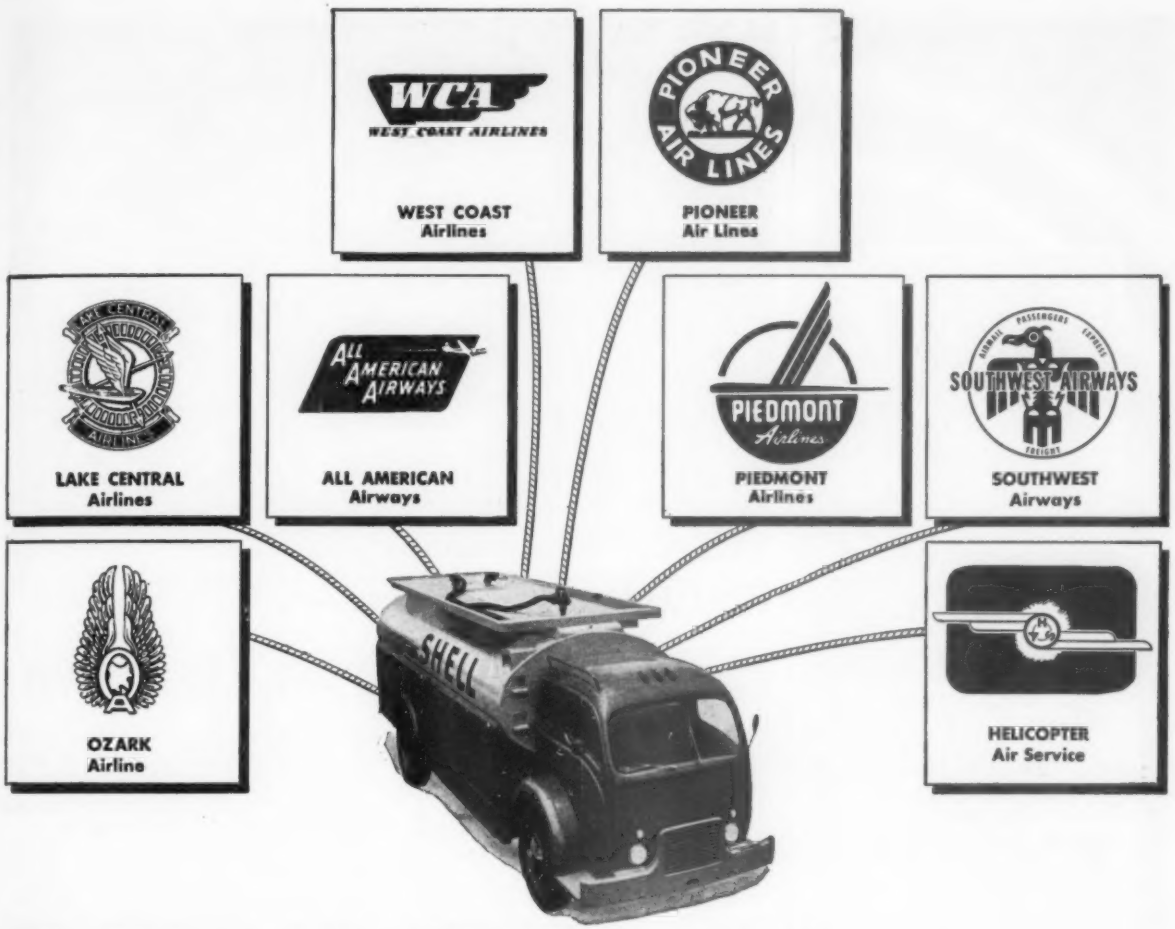
(McGraw-Hill World News)

Melbourne, Australia—Largest order of its kind yet placed by the Royal Australian Air Force, reportedly amounting to several million dollars, has gone to Bendix Aviation Corp. of U.S.A. and its Australian partners.

The order is for American-patented aircraft electrical equipment and was negotiated by Bendix general manager C. T. Zaoral.

Bendix recently became associated with the Australian firm of Tecnico and a large part of the order will be supplied by the new firm of Bendix-Tecnico Pty. Ltd. from its factory at Marrickville, Sydney.

Further orders with American companies are expected to be placed by RAAF.



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SORTING of mud-and-oil-soaked papers after destructive Kansas City flood waters recede is first step on TWA's washday.

How TWA Saved Its Files

Kansas City, Mo.—What can an airline do to salvage its records after they have had a week-long mud-and-oil bath?

That was Trans World Airlines' problem when the Kansas City flood July 13 poured up to 15 ft. of water in its office areas, soaking all cost accounting and pay-roll records, and inventory records listing $17-million-worth of engines and spare parts. Also damaged by the rampaging river were Ditto and Mimeograph reports, vellum and blueprints.

H. E. Protzmann, TWA's general office manager, and Marie Acton, supervisor of files, called CAB, the National Archives in Washington, and other groups which might have had a similar problem for advice on how to salvage soggy paper. These calls resulted in little information.

▶ **Homemakers' Recipe**—So the home became the laboratory for investigating the best methods of salvaging paper, and the housewife often became the technician. Oven-baking the records was futile; laying them out on the floor proved better; best was ironing.

The flat iron was used for small, flimsy records, household mangles for vellums and blue prints. Heavy cards such as Kardex dried satisfactorily on the floor. Large blueprints, too bulky to run through mangles, were neatly folded over clotheslines.

When the water in the offices dropped to the 2-to-3-ft. level on July 20, Protzmann and crew were faced with the problem of finding a building large enough to house all the paper as it was trucked from the offices. And how to wash a million pieces of paper and keep them wet to prevent drying out and sticking. And how to combat mildew which was fast setting in.

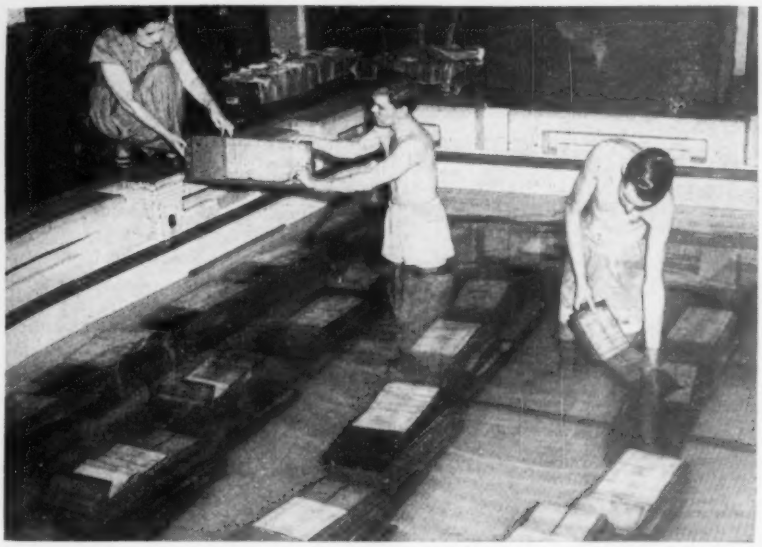
Kansas City's Board of Education proved to be TWA's salvation. They offered the use of a high school, complete with swimming pool. After conducting careful tests to make sure the chlorine content of the water would not bleach prints, truck after truck of paper was hauled to the school, where the paper was given the type of treatment home experimentation had indicated. Sewage and oil on the records complicated the business of salvage and made it necessary that personnel handling the records be immunized for typhoid.

▶ **Tools for Salvage**—Nine mangles and a dozen flat irons were lined up at the swimming pool's edge. Paper was fed to them as it was washed. Many records were stored in the pool to prevent drying and sticking. Some 3,000 ft. of clothesline were strung around the school to hang prints on, while hundreds of square feet of floor space were covered with heavier cards. Scores of fans circulated air to speed drying. "Merkil" was sprayed on mildewed records and proved an effective counteragent to fungus, a good deodorizer.

After 27 days and 27,000 man hours of round-the-clock, sloppy labor, a great percentage of the records had been saved. Protzmann said that just reorganizing and folding the paper was in itself a mammoth job. He estimated that it would have cost TWA over

(*Continued on page 68*)

This Is the Way They Did Their Wash . . .



WASHING in high school swimming pool is the next step. Employes handling the records, part of TWA's 1-million-piece files at Kansas City, had to get typhoid shots because of sewage contamination. Cleaned papers are handed up for . . .

IRONING on mangles (for blueprints and vellums) and with flatirons (for smaller papers). Nine mangles and 12 flatirons were used. Kardex files were found to dry better when laid out on the floor in the school halls.

HANGING proved to be the answer for blueprints too large for the mangles. Microfilm weathered the storm with negligible loss. TWA figures it would have cost $300,000 to replace the records, if replacement were possible.

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You are welcome to discuss your particular problems with our partners. Without obligation, call or write Department T-5 for an appointment.

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(*Continued from p. 66*)

$300,000 to replace the records salvaged—had that been possible.

► **What TWA Learned**—Here are some lessons TWA learned the hard way in the disaster:

• **Metal file cabinets** usually held up well, but if full, swelling paper burst open the front. Wooden files disintegrated.

• **Photograph negatives** stored in bond paper envelopes were generally salvageable. Those stored in manila envelopes were ruined because the soft emulsion stuck to the manila.

• **Pencil** turned out to be the most nearly indestructible form of recording, according to Protzmann, closely followed by India ink. Offset, Mimeograph and typewritten matter generally came out all right. Ordinary inks washed out badly, as did Ditto. Protzmann added that the blue Ditto color contaminated any adjacent papers, making them useless.

• **Microfilm** gave TWA a pleasant surprise. About 15,000 ft. of film was back and serviceable two days after being sent to Recordak for rehabilitation. TWA stored the film in waste paper baskets full of water when sending the film to Recordak. Loss was low.

Cost of the tremendous salvage was negligible since most of the employes who did the job normally worked in the flooded-out offices. And TWA is proud of the willing hand its hundreds of employes gave during the emergency that could have turned into a catastrophe.

–G.L.C.

Automatic Approach Equipment Trainer

An automatic landing approach flight simulator designed to simplify training of USAF ground personnel in maintenance of automatic approach equipment has been developed by Northrop Aircraft, Inc.

To achieve maximum realism, the device duplicates the flight of a Northrop F-89 Scorpion all-weather fighter during automatic ground approach procedure.

A platform model plane is pivoted on a conical pedestal to provide pitch and roll. The pedestal can rotate on its base to provide yaw. The model is fitted with an autopilot, localizer and glide path equipment, Zero Reader, marker beacon, remote indicating compass and cockpit lighting equipment.

Marker beacon, localizer and glide path indicator signals are broadcast by test oscillators automatically controlled by the model as it maneuvers. The instructor operates the autopilot flight controller to program approach flights involving simple maneuvers such as rolls, climbs, dives and turns.

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Needed now in Seattle are experienced and junior aeronautical, mechanical, electrical, electronics, civil, acoustical, weights and tooling engineers for design and research; servo-mechanism designers and analysts; and physicists and mathematicians with advanced degrees. ***(More housing is available in Seattle than in most other major industrial centers.)***

Or, if you prefer the Midwest, similar openings are available at the Boeing Wichita, Kansas, Plant. Inquiries indicating such a preference will be referred to the Wichita Division.

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Boeing Airplane Company, Seattle 14, Wash.

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What you can do to help

1. Appoint one top official in your plant to take full responsibility for surveying the plant and getting out the scrap.
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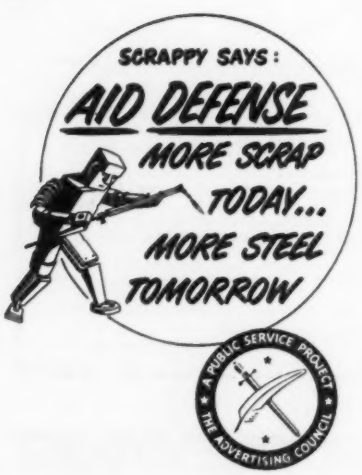
3. Call in your local scrap dealer to help you work out a practical scrapping program. Non-ferrous scrap needed, too!
4. Write for free booklet, "Top Management: Your Program for Emergency Scrap Recovery", addressing Advertising Council, 25 W. 45th St., N. Y. 19.



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Steel production	1950	97,800,000 net tons
Estimated capacity	1952	119,500,000 net tons
Purchased scrap used*	1950	29,500,000 gross tons
Estimated purchased scrap requirement*	1952	36,200,000 gross tons

*All consumers

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NEW AVIATION PRODUCTS

Plane Fuel Treated

A new dehydrator, designed to remove moisture from aviation gasoline with maximum effect, has been developed by Bowser, Inc.

Engines using fuel previously treated by the dehydrator will gain in higher combustion efficiency, reduced carbon formation and corrosion of working parts, Bowser claims. Small quantities or large slugs of water can be eliminated easily with the new unit, it says.

The device comes in capacities of 350 and 600 gpm. and can be used for maximum working pressures up to 125 psi. Dehydration is accomplished by passing the gasoline through a combination of wound cellulose cylinders, specially treated coalescing media, perforated metal and glass cloth. There are no moving parts, and with reasonable care the elements in the dehydrator will last indefinitely, according to the company. Where there is the possibility of large volumes of water in the fuel, a hydraulically balanced, automatic ejector is available as an accessory.

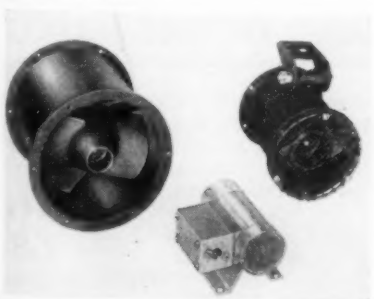
Bowser, Inc., Fort Wayne, Ind.

Actuator Control

A new aircraft temperature control system for use with actuators has been developed by Barber-Colman Co.

Dubbed the "Micropulse," the system is intended for control of any standard reversible actuator or actuator-valve combination without mechanical or electrical follow-up and without feedback from the actuator. As explained by the firm, the Micropulse "has a proportional pulse duration that automatically matches system response requirements and actuator speeds for accurate, stable control."

Barber-Colman Co., Aircraft division, Rockford, Ill.



Breeze for Avionics

Space-saving vane axial blowers for cooling avionic equipment such as radio transmitters, radar sets, detection devices, etc., have been placed on the market.

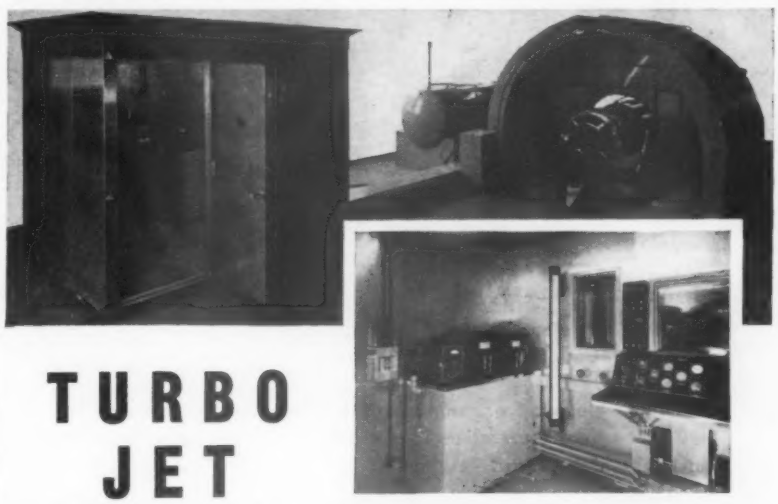
These compact units are made in sizes ranging from a diminutive 2-in. model to a 6-in.-diameter model. Intermediate sizes are available. The fan motor, placed directly into the airstream, is kept cool enough to operate at top load condition, insuring delivery by fan of maximum air volume and pressure, the maker explains. Speeds range from 3,300 to 10,000 rpm., depending on requirements. Blowers are made of aluminum alloy, are available in models for operation on either a.c. or d.c. current.

Stanat Tool & Machine Co., 47-28 37th St., Long Island City 1, N. Y.

Aircraft Coupling

A new speedy disconnect coupling for aircraft electrical conduit has no threaded connections, but separates when a pull of 10-40 lb. is exerted.

The coupling is joined or disconnected through action of a series of movable fingers around the circumference of one section of the part. The



TURBO JET ENGINE TEST UNIT

Designed expressly for fast trouble-shooting and overhaul testing of all Air Forces and Navy jet aircraft engines now in use, this portable, prefabricated jet engine test cell has ironed out kinks in maintenance caused previously by limited testing facilities at advanced military bases. It includes sound-proof control room, all controls, instrumentation, fuel and lube oil supply systems.

Testing all operations in less than an hour, it is easily convertible to accommodate two engines on test simultaneously. In this manner the number of spare engines required at advanced bases is appreciably reduced permitting not only large savings in original equipment but in maintenance costs as well.

JANKE and COMPANY, Inc.

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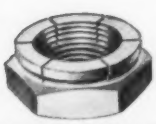

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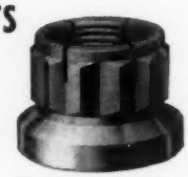

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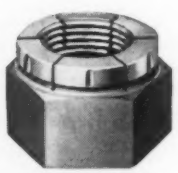


"FLEXLOC" SELF LOCKING NUTS (REGULAR)

serve as both stop and locknuts. One-piece construction—resilient segments lock positively with uniform torque. Aircraft approval of sizes from #4 to 1" inclusive in steel, brass, aluminum. Since regular steel FLEXLOCS are approved for temperatures to 550° F., you need stock only one type locknut for this temperature range. Dept. 51.

For further information on products shown in this advertisement please address departments listed. Inquiries on other aircraft parts should be addressed to Department 678.

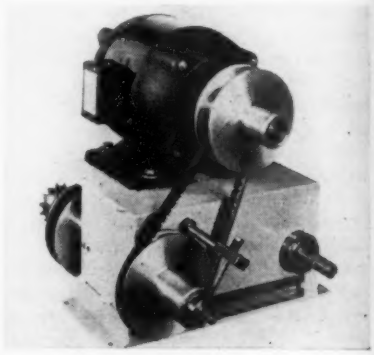
SPS STANDARD PRESSED STEEL CO.

JENKINTOWN 3, PENNSYLVANIA

fingers grip or permit ejection of the mating section, depending on the tension of a built-in coiled spring.

While the coupling can be separated by a quick, substantial tug, a tight, moisture-proof connection is assured when the mating parts are joined, says the firm. The coupling has been pressurized and tested to 750 psi.

E. B. Wiggins Oil Tool Co., Los Angeles.



Jet Tach Drive

A new V-belt drive, said to be highly useful in calibration of jet engine instruments, has been developed by Speed Selector.

The special purpose drive has been found most suitable for calibration of jet controllers, tachometers and other aircraft instruments, the maker says. It is available in several models, from light tachometer drives of ½ hp. or less, to heavier, 10-hp. units.

No hunting and a nearly complete absence of drifting holds speed variations in this drive to less than ¼ of 1% for any speed throughout the range, the company says. Speed ranges from 150 to 7,500 rpm. and drive ratios up to 50:1 are achieved by compounding successive pairs of wide-range combination sheaves.

Speed Selector, Inc., 118 Noble Court, Cleveland.

ALSO ON THE MARKET

Screwstarter is a small tool designed to handle difficult screw starting jobs in inaccessible locations in radio equipment, on instrument panels, etc. Unit automatically releases when screw is driven tight. Herbrand Tools, Inc., Fremont, Ohio.

Pro-Kaps can be snapped onto grease fittings on aircraft to keep out dirt and grit. They also serve to indicate clearly location of all grease points, and are available in various colors. Van Dusen Aircraft Supplies, Teterboro Air Terminal, Teterboro, N. J.

Since 1938... PLEXIGLAS Has Kept Pace

PLEXIGLAS canopy, nose and windows on the Boeing B-47A. Canopy, nearly 8 feet long, is laminated; windows are PLEXIGLAS II.* Fabrication by Goodyear Aircraft Company.

*Meets Army-Navy Material Specification MIL-P-5425.

From its use as a landing light cover on the nose of a globe-circling plane, to a position as *aviation's standard material* for transparent enclosures and windows—PLEXIGLAS has kept pace with the industry's rapid growth.

In 1938, when Howard Hughes took off on his flight around the world, PLEXIGLAS rode with him—shielding the landing light in the nose of his Lockheed 14. It was a dramatic use of a new material. Within less than two years, Rohm & Haas had developed methods of producing and forming *large* PLEXIGLAS sheets for airplane enclosures, and helped make possible the improved aerodynamics of the planes of 1940-50.

On *today's* planes, too, PLEXIGLAS is the standard transparent material. With improved heat resistance and stress-solvent craze resistance, PLEXIGLAS II meets rigorous Army-Navy specifications for current high-speed, high-altitude aircraft. And the present trend toward *laminated* enclosures on combat planes is possible because of the adaptability of PLEXIGLAS to the necessary laminating and fabricating techniques.

For the planes of the *future*, Rohm & Haas laboratories are working to raise the quality of transparent plastics to even higher standards. Our technicians and service staff stand ready to help in any problem involving aviation applications of PLEXIGLAS.

Our new Handbook for Aircraft Engineers should be in your hands. Send for it.

PLEXIGLAS landing light cover on nose of Howard Hughes' globe-girdling Lockheed 14. Hughes' record-breaking flight broadened dramatically the field of aircraft design and performance.

PLEXIGLAS *is a trade-mark, Reg. U. S. Pat. Off. and in principal foreign countries.*

Canadian Distributor: *Crystal Glass & Plastics, Ltd., 130 Queen's Quay at Jarvis Street, Toronto, Ontario, Canada.*

CHEMICALS FOR INDUSTRY

ROHM & HAAS COMPANY

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Representatives in principal foreign countries

Blind Copter Flying Techniques Disclosed

• New instrumentation aids Los Angeles Airways in winning first all-weather operations certificate.

• Stability is a problem, but LAA chief pilots say it is no more so than in flying contact.

• And autopilots for rotor-wing aircraft are being watched with considerable interest by company.

Los Angeles Airways, Inc. was the first helicopter service to win an instrument air-worthiness certificate. The years of experimentation, the problems encountered and the final success are vividly described in this article, written expressly for AVIATION WEEK *by the chief pilot and director of training for LAA.*

By C. B. (Kess) Kesselring

Based upon the experience which led to the granting of the first instrument airworthiness certificate for helicopters to Los Angeles Airways, Inc., our company foresees regularly scheduled takeoffs, flights and approaches at extremely low weather minimums as imminently practical.

At the moment we don't profess to have all the answers toward reaching this goal. However, we have inaugurated an all-out program of investigation and experimentation. By the time our twin-engine equipment is available, we hope to have a grasp of instrument airway and approach techniques that will enable us to put it to all-weather use with little delay.

► **Early Experiments**—Events leading to receipt of the instrument certificate a few months ago date back to 1948. That year, just prior to the time LAA began scheduled night operations hauling the mail, we installed air-driven attitude and directional gyros. Although not certain just how good a job of precision instrument flying we could do, our fixed wing flying at night made us sure that the attitude and directional gyros plus the ball bank indicator would be definite night-time aids. Except for a limited number of hours by the Air Force in 1944 in the immediate vicinity of airport lights, there was no night helicopter flying experience predating ours.

From the spring of 1948 to the spring of 1949, efforts were centered upon improving our night flying techniques and in checking and experimenting with every weather variation in the area affecting contact flight. In the L. A. area, there were many.

Finally, after periodically lowering our contact minimums as our experience built up, we met a stopper. We learned that when we encountered any radical change in our contact minimums we would be forced to depart from safety standards maintained by the company. It was then crystal clear that the only step left to improve the reliability of our scheduled service was instrument flight.

► **Pitch Movement**—During the 1948-49 year of experimentation, we had learned a great deal about instrumentation for helicopters. First, there was the attitude gyro. It proved of great assistance in the early stages, not only as a confidence builder but as a practical aid in the blacked-out areas away from urban ground lights.

Our need for a reference for pitch movement fore and aft was filled by the Sperry F-3 attitude gyro. Non-spillable, and with pitch markings on the face, the F-3s were used for approximately two years. Sperry shared with us the troubles we had using vacuum-type instruments on helicopters in the L. A. area.

Due to the excess amount of dust and dirt in the air at our normal flying altitudes of three to 1,500 ft., the gyros had to be overhauled about every 130 hr. of flight time.

In addition to the smog effect, we experienced slight attitude gyro errors.

Annoying and apparently unavoidable, these errors were due to the slow speed and slight oscillation that is normal in helicopter flying. Moreover, Sperry learned that the 2½ deg. tilt that is used in setting the instruments for higher speed, fixed-wing aircraft had to be changed to zero. With zero settings, the instruments worked quite normally. On the favorable side, we learned that the 3 in. instrument face was not too small to detect attitude errors satisfactorily.

► **New Instruments**—Ball bank indicators came in for modification too. Due to the oscillation mentioned previously, the ball bank was unreadable in slightly rough air. By reducing the sensitivity of the instrument, it worked conveniently and we are now able to fly the helicopter on instruments using the rate instruments only. We experience no difficulty with the Gyrosyn compass as it appears conventional at all times.

Our instrument airworthiness certificate is based upon new instrumentation—hermetically-sealed, electric instruments. They are the Sperry H-5 Gyro Horizon, the Sperry C-2A Gyrosyn and the Schwein ball bank indicator. In contrast to the F-3, the H-5 Horizons are running their full guaranteed time between overloads with no trouble whatever.

Inasmuch as the H-5 is a conventional horizon indicator and departs from the attitude gyro face design, we have had Sperry attach a grid to the trim indicator. The grid extends 15 deg. above and 8 deg. below center line.

With the grid installed we believe that the completely blind takeoff is one of the neatest and most precise maneuvers that we are able to execute.

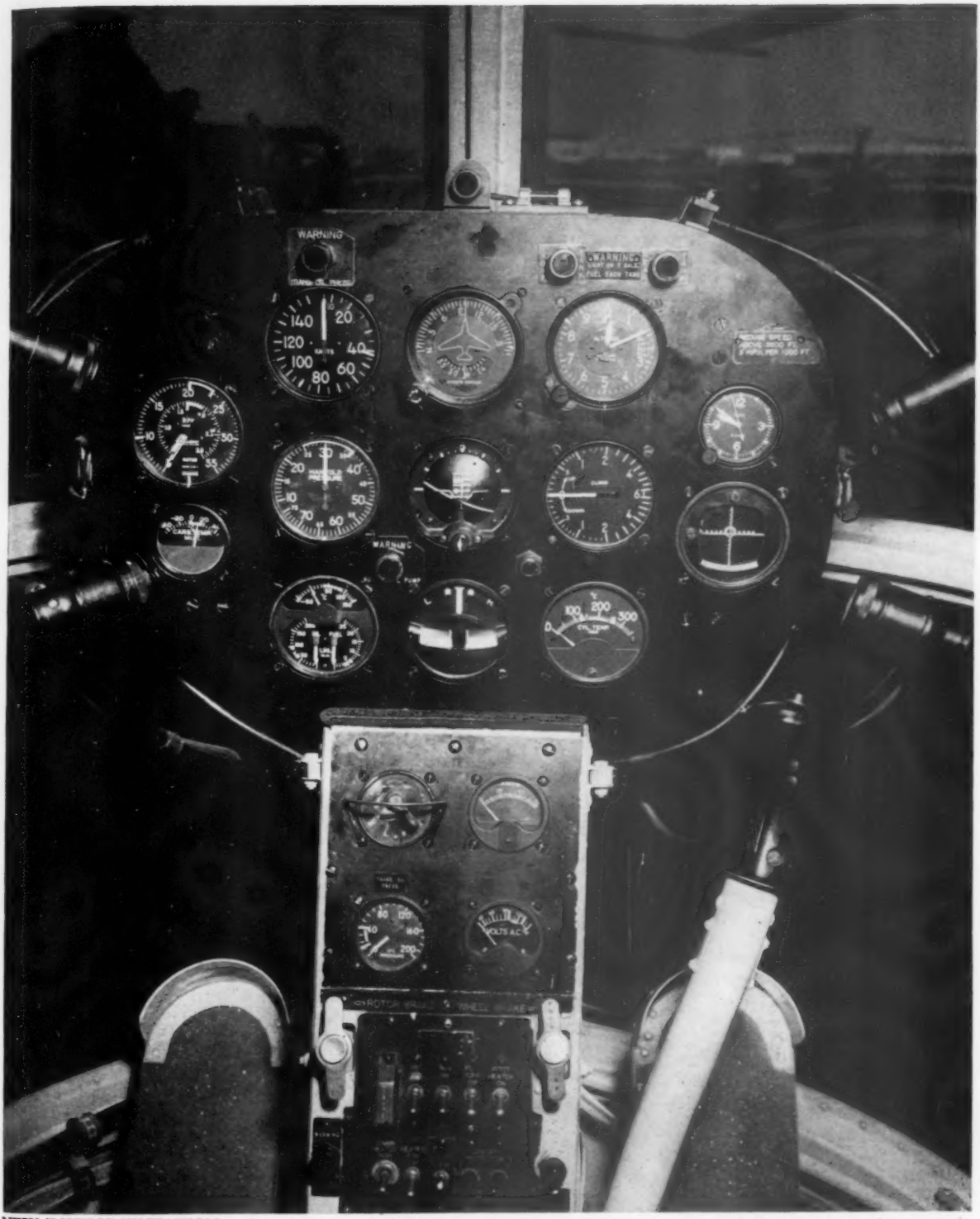
Moreover, since the cruising attitude of the helicopter is about 8 degrees "nose low," Sperry has also extended the arm that holds the miniature airplane so that it may be placed 8 deg. nose high prior to takeoff. With this modification, use of the Gyro-Horizon is relatively normal in cruising, climbs and descents.

► **Step by Step**—In the light of our own enthusiasm, and in view of the skepticism we have heard with respect to a completely blind takeoff in a helicopter, I review below the steps in our instrument takeoff:

• **Following** engine and instrument warmup period, pilot taxis to takeoff position and checks flight instruments for proper functioning.

• **Pilot** hovers aircraft to determine exact C.G. control and exact setting of the bungee controls in relation to the takeoff.

a. Checks friction locks on throttle



NEW INSTRUMENTATION on LAA helicopter, including Sperry Gyrosyn compass at top center, H-5 Gyro-Horizon (under compass), and Schwein ball indicator, permit all-weather flying for helicopters. ILS cross-point indicator is shown far right.

and pitch lever for proper setting.

b. Pilot notes amount of rudder control necessary to hover—the amount necessary depends upon such factors as temperature, surface winds, gross load. This check aids the pilot in determining necessary amount of rudder for takeoff.

• **Pilot** levels aircraft in relation to bubble on aircraft for that purpose and sets miniature airplane 8 deg. above horizon bar.

• **Pilot** rechecks Gyrosyn compass in relation to magnetic compass heading.

• **Pilot** applies full power using 2,400 rpm. and 37 in. manifold.

If the pitch stick and throttle are pulled through the setting of 2300

rpm. and 23 in. manifold, then 2,400 rpm. and 37 in. of manifold results in the full power setting with a minimum amount of adjustment.

• **Although** rudder pressure will appear to be quite heavy as the aircraft breaks ground, it will decrease proportionately as the airspeed increases.

• **As the helicopter** leaves the ground with the application of full power, the attitude of the aircraft should be changed smoothly but definitely to a position indicating 5 deg. dive on the miniature Gyro-Horizon airplane. (This is 13 deg. actual dive position inasmuch as the miniature is set at 8 deg. above the bar prior to takeoff.)

• **From this point** the two important instruments to watch are the Gyrosyn compass and the Gyro-Horizon, with an occasional check on the ball bank indicator, to insure coordinated flight in the transition from zero ground speed to 50 mph. climbing airspeed.

• **As the airspeed** approaches 50 mph. (lead the instrument approximately 5 mph.), pilot throttles back to 2,300 rpm. and 31 in. manifold (climb power setting) and changes attitude of miniature airplane to a position slightly above the horizontal bar, cross-checking against airspeed at 50 mph. to determine the exact position necessary to hold the miniature airplane on the horizon in the climb.

By following these instructions we are confident that absolutely blind takeoffs can be entirely practicable in scheduled passenger service. With no problem of controlling the aircraft down a runway to gain flying speed, the blind helicopter takeoff is definitely easier than in fixed wing craft.

► **Lower Minimums**—Our first attempts at instrument flying proved to be very tiring, but we recognized that none of our pilots had instrument flown for the prior three years. Starting with elementary maneuvers we were soon convinced that we could not only fly instruments conventionally but we could work out various maneuvers and techniques that would be particularly advantageous to helicopters. We foresaw flying minimums lower than those employed by present fixed-wing aircraft.

While the instability of the helicopter is a factor to be reckoned with, it is no more insurmountable than the instability in steering an auto on a highway.

Admittedly, the 'copter is more work to fly on instruments than the average airliner, but it is no less stable on instruments than on contact flight. Helicopter pilots recognize this. Further, we have kept pilots on simulated instrument flight up to two and one-half hours working navigation and approach problems with no serious errors in solving problems precisely and no undue fatigue.

Whereas the practical nature of instrument flight is established, our scheduled work on instruments will be limited until we have the added safety provided by twin-engine equipment. Nevertheless, our operations to date, often conducted at 7,500 ft. on top of overcasts but within gliding distances of clear areas, have been guided with amazing accuracy by surveillance radar.

Simulating engine failure, we have been directed to a predetermined forced landing with a degree of accuracy that gives up a safety factor unapproached by fixed-wing, single-engine instrument flying. This is so particularly in view of the fact that we are able to execute controlled approaches with airspeeds as low as 20 mph.

► **Radar Directed**—Typical example of a surveillance radar controlled instrument climbout from Los Angeles is as follows: Radar directs the helicopter on the climbout to the coastal beach on a Gyrosyn heading of 250. Over the beach the plane is directed to Santa Monica. Here, with a minimum altitude of 7,500 ft., the flight is directed to the Hansem Dam via a Gyrosyn track of 17 deg.

The climb to 7,500 is time consuming, but safety makes it well worth the time. From that height radar can di-

Highest Ski-Freight Operations Ever Carried Out in Alaska . . . Made Possible with Federal Wheel-Skis

In a joint expedition by the Boston Museum of Science, the University of Denver, and the University of Alaska, the 20,270 foot summit of Mt. McKinley of Alaska was reached and mapped in June and July of this year.

The Expedition was serviced by a Piper Cub flown by Dr. Terris Moore of the University of Alaska. The airplane was equipped with FEDERAL COMBINATION WHEEL-SKIS, which enabled the expedition to freight equipment and supplies to the expedition's base located at the 10,000 foot level on the Kahiltna Glacier.

Federal Aircraft Works takes great pride in the part our product played in helping make this expedition a success.

FEDERAL AIRCRAFT WORKS
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Master Ski Builders Since 1925

MUSEUM OF SCIENCE

September 10th, 1951

The Federal Aircraft Works
3456 North Mississippi Drive
Minneapolis 12, Minnesota

Dear Sirs:

I am sure you will be interested to know that a pair of Federal Wheel-Skis on a Piper Super-Cub were used with extraordinary success on our recent expedition to explore and map the west face of Mt. McKinley in Alaska. The expedition was sponsored by the Museum of Science, the University of Denver and the University of Alaska.

The key to the success of the project was a series of airplane-landings at two points on the Kahiltna Glacier at altitudes of 7,600 and 10,000 feet. Unlike most expeditions which have used heavy aircraft, we used a Piper Super-Cub 125, equipped with your hydraulically-operated Wheel-Skis. The aircraft was flown by President Terris Moore of the University of Alaska. More than a dozen landings were made at the record altitude of 10,000 feet, with loaded take-offs and with runs rarely exceeding 800 feet.

These flights were made during June and July when there was no snow in the lowlands for take-offs, so the expedition would have been impossible without Wheel-Skis. As a result of Dr. Moore's splendid piloting and your excellent Wheel-Skis, we rapidly transformed record landings into a routine operation and this little airplane was the key to the success of our project.

It is a pity these Wheel-Skis have not been available before this as we could have used them constantly during our last twenty years of Alaskan mountain exploration.

Sincerely yours,
Signed
Bradford Washburn
Director

BW:hcs

BOSTON SOCIETY OF NATURAL HISTORY

Photos by and through courtesy of Bradford Washburn, Director of The Boston Museum of Science. Inset Dr. Terris Moore checking gear at expedition base at 10,000 foot level. Background pictures Dr. Moore, his Piper Cub and Mt. McKinley Summit.

rect the helicopter to a number of forced landing areas located close to the track.

A recent addition to our instrumentation is the radio compass. It has been installed with plans to use it as an aid in on-top navigation and in working conventional approaches into Ontario, Long Beach and Los Angeles airports.

At Los Angeles Airways we're shooting for instrument approach efficiency not known to fixed wing flying. We consider it an economic must that we can't waste as much as a minute from Pasadena to L. A. where the total flight, flying contact with our present outmoded equipment, takes just 15 minutes. We believe that helicopter procedures must necessarily be divorced completely from fixed wing flying and that identifications en route must be so positive that straight-in approaches will be commonplace rather than exceptional.

Before the end of the year we will install for experimentation new absolute altimeters, air speed indicators accurate to as low as 2 mph., and direction indicators operative at low speeds. We are watching with interest the successful application of automatic pilots in helicopters, and can appreciate that they have a future as a precision aid to navigation and as a reducer of fatigue.

▸**Zero Zero**—In our opinion, approach time may be kept to a minimum by the use of cone shaped glide paths with an approach angle of 5 to 7 deg. combined with baby omni stations, high intensity lights and marker beacons to provide straight in approaches from all route directions.

With respect to our experiments with conventional high intensity lights in zero zero conditions, we have been able to see the lights for a minimum distance of 500 feet. Coupled with our present ability to execute precision approaches in the 20 to 30 mph. speed range and our new instrumentation, we are optomistic about approaches in adverse weather.

With 35 heliports in the Los Angeles Airways system alone, installing a helicopter airway appears a tremendous undertaking. Considering the potential of the service offered (ranking close to overland bus in cost), the economics of setting up such an airway seem practical.

Carriers Tackle Alaska Cargo Rush

Air lines serving Alaska from Seattle, Wash., have been adding extra flights to accommodate an unprecedented amount of cargo, expect the heavy volume to continue through November.

• **Pan American World Airways** will operate an extra freight section each

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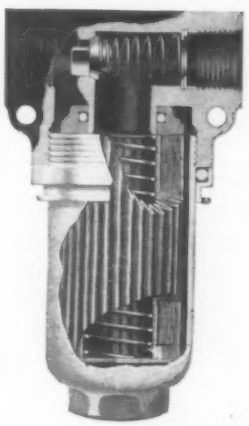
Nine times out of ten ***Bendix-Skinner*** Filters will supply the "finest" answer to your filtration problems. Here are the facts: available with patented, exclusive, resin impregnated cellulose elements; simple, quick replacement; high flow rate with minimum pressure loss; over 350 models providing filtration from ½ micron (.000019") upwards at flow rates from 1 to 5000 g.p.m. Why not let ***Bendix-Skinner*** filtration engineers work with you? Write us direct.



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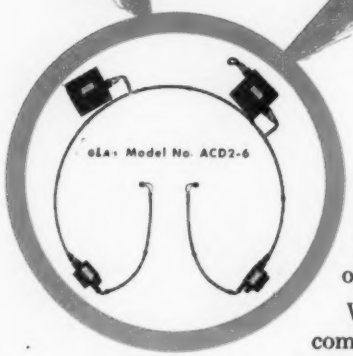

. . . Not Necessarily So! Especially if the engine is equipped with a dependable GLA ignition system. The Model ACD2-6 *high energy condenser discharge system*—specified for many of the latest air force aircraft—is typical of the many complete systems built by GLA. Their performance is uniform under varying conditions of operating environments.

We specialize in equipment which combines advanced electronic development with unique space and weight-saving design. Solving complex ignition problems and producing the equipment is our business—our Engineering Department invites your inquiry. May we hear from you?

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week this month to Ketchikan, Juneau and Fairbanks, will continue this extra service through November if volume warrants.

• **Alaska Airlines,** which had to cease its Alaska passenger service while it overhauled its planes, has four C-46 transports on an all-freight service from Portland, Ore., and Seattle to Fairbanks and Anchorage. It hoped to resume passenger service before the end of this month.

• **Northwest Airlines** had a 30-000-lb. backlog at one time but ordered extra freighter flights to whittle it down. It has added a combination passenger-cargo flight to its Alaska schedule, increasing its Alaska-lift potential to 20,000 lb. a day on its regular flights. In addition, it is operating a DC-4 freighter daily to the territory.

• **Pacific Northern Airlines,** which recently inaugurated scheduled service to Anchorage, is carrying capacity freight loads in its passenger planes, would add extra sections if it had the equipment.

• **Air Transport Associates,** Seattle nonsked ordered out of business by CAB, sends one C-46 northward each night, reports it receives requests to handle from 20,000 to 25,000 lb. daily but can handle only 4,000.

Avianca's Claim: First in Freight

(McGraw-Hill World News)

Bogota—Avianca, the Colombian carrier, repeats its claim to world leadership in the carriage of air freight and express, maintaining at the same time that it had not been surpassed on a volume basis by any schedule or non-schedule air carrier since December, 1949.

From Jan. 1 to June 30 of this year the carrier transported a total of 61,532,160 lb. of revenue cargo in scheduled operations, of which 95% moved over Avianca's domestic lines within Colombia. This gives a monthly average of over ten million pounds or a sustained daily average of 170 tons per day, an increase of 51% over the same period last year.

While cargo accounted for 53% of the total Avianca lift, revenue from cargo operations was less than 30% of gross income. Income from freight operations worked out at 28 cents per ton-mile.

Of Avianca's total fleet of 43 aircraft, 14 is employed exclusively in freight-operations. Included are two C-54s, five C-46s and seven C-47s. Each type of aircraft accounted for about the same tonnage during the period, with the two C-54s holding a slight lead: load factor on this type of aircraft for the six months was 91%.

Materials for Civil Air Production

(DPA Allotments to NPA* for Aircraft Production, First Quarter, 1952.)

	Civil Planes	Military and Civil Plane Equip.	Total Aircraft "B" Products
Carbon steel, tons	205	2,675	2,880
Alloy steel, tons	1,341	7,099	8,440
Stainless, 1,000 lb.	435	1,725	2,160
Wire mill copper, 1,000 lb.	68	707	775
Brass mill copper, 1,000 lb.	82	81	163
Foundry copper, 1,000 lb.	69	701	770
Aluminum, 1,000 lb.	4,599	2,901**	7,500**

** National Production Authority's Aircraft division distributes CMP materials for all whole civil aircraft and for both military and civil aircraft equipment. These all are called "Aircraft B Products." Equipment includes landing gear, heaters, pumps, hydraulic controls, ignition harness, engine stands, fuel metering and other components.*

*** Defense Production Administration alloted only 6 million lb. aluminum, but NPA allowed another 1.5 million lb. from a reserve.*

Civil Production Pinch Is Eased

DPA approves first quarter materials requests; yearly rate set at 200 transports, 3,500 light planes.

Civil aircraft makers are set to receive "full requirements" of aluminum, copper and steel to meet delivery schedules on transport and non-carrier planes the first quarter of 1952. This is the word that National Production Authority's Aircraft division passed along to the industry last week, quieting earlier fears of curtailed allocations.

It is the first solid indication that Defense Production Administration will support continued production of essential civil aircraft at approved levels throughout the expected materials shortages of 1952 (AVIATION WEEK Oct. 8, p. 70-71). The DPA has approved civil aircraft production at a rate of 3,500 small planes per year and, so far, 51 transports this last quarter of 1951, 200 transports all next year and 114 in 1953.

The delivery schedules shown on page 80 are firm orders already approved by the DPA. The materials allotments DPA has just made to the manufacturers are to complete the planes shown as scheduled for first quarter, 1952, delivery and to continue construction and assembly on those shown set for delivery thereafter.

The schedules shown are the Air Coordinating Committee C-4 program approved this quarter.

Next quarter a new ACC C-5 program will come up for DPA approval. It will include new orders such as American Airlines' 30 more DC-6s and DC-6As placed since August and to be approved for the mobilization program by the claimant agencies and by DPA.

Ultimately, there will be about 300 transports ordered for 1953 delivery, the airlines has estimated for mobilization authorities. That includes: 114 planes shown as already approved for 1953 delivery; about 162 U.S. airline orders either placed since August, or under negotion; an estimated 24 anticipated foreign airline orders for U.S. planes.

The transports airlines expect to order for 1953 delivery include more Martin 4-0-4s, Convair-Liner, Lockheed Super Constellations, and Douglas DC-6As and DC-6Bs.

All told, civil aviation mobilization authorities expect delivery of about 50 transports this quarter, 200-odd next year, and about 300 in 1953. Changing airline economics or engine and parts supply may, of course, modify the estimate.

► **Claims Justified**—Full materials requirements to meet the approved civil plane schedules the first quarter were approved, DPA officials say, because the materials requests were "fully explained and justified" by the claimants and "appear accurate."

But DPA officials cut the materials allotments requested for military aircraft equipment and components after: 1. Appraisal of claimant explanations and justifications; 2. Survey of manufacturer inventories, and, 3. Allowing for "slippage" in previously-estimated first-quarter production schedules due to lagging engine deliveries and certain other bottlenecks.

DPA considers that the cut in first-quarter controlled materials allotments

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to produce components parts and complete package units through its own facilities including more than: 150 production and tool engineers, tool designers. $500,000.00 late model machine tools. 125,000 square feet productive space for machining, sheet metal work, assembly, inspection and the production of complete aircraft

and

assembling, painting, tool making, sheet metal, template, riveting, bonderizing, heat treating

and

proven performance for:

a blue ribbon list of the nation's leading aircraft manufacturers

Complete information provided on request

New Transports on Order and Schedule of Delivery

MODEL	AIRFRAME WEIGHT	ENGINE MODEL	MFG.	AIR CARRIERS	1951 4TH QUARTER	1951 TOTAL	1952 1ST QUARTER	1952 2ND QUARTER	1952 3RD QUARTER	1952 4TH QUARTER	1952 TOTAL	1953 1ST QUARTER	1953 2ND QUARTER	1953 3RD QUARTER	1953 4TH QUARTER	1953 TOTAL	GRAND TOTAL
Douglas																	
DC-6	40,600	R-2800-83A	P&W	Braniff	1	1											1
DC-6A	40,800	R-2800-CB-17	P&W	Slick	1	1						3				3	4
DC-6B	44,000	R-2800-CB-16	P&W	American	5	5						3				3	8
DC-6B	43,770	R-2800-CB-16	P&W	Western					1	3	4	1				1	5
DC-6B	44,000	R-2800-CB-16	P&W	Panagra	1	1	1				1						2
DC-6B	45,400	R-2800-CB-17	P&W	Pan American	4	4	5	6	3		14						18
DC-6B	43,900	R-2800-CB-16	P&W	United				6	6		12						12
DC-6B	44,000	R-2800-CB-16	P&W	National					2	4	6						6
DC-6B	44,000	R-2800-CB-16	P&W	National						2	2						2
DC-6B	45,200	R-2800-CA-15	P&W	SAS			2				2						2
DC-6B	45,500	R-2800-CB-17	P&W	SAS					1	5	6						6
DC-6B	44,100	R-2800-CB-17	P&W	Swiss Air						1	1						1
DC-6B	45,700	R-2800-CB-17	P&W	KLM			4	3			7						7
DC-6B	45,700	R-2800-CB-17	P&W	SABENA								2	4			6	6
DC-6B	45,600	R-2800-CB-17	P&W	T.A.I.(French)									3			3	3
DC-6B	45,300	R-2800-CB-17	P&W	Philippine			1	1			2						2
DC-6B	43,600	R-2800-CB-17	P&W	CPA						2	2	1				1	3
DC-6B	45,000	R-2800-CB-17	P&W	Aramco			1		1		2						2
DC-6B	43,000	R-2800-CB-16	P&W	C.M.A.(Mexico)									1	2		3	3
Total Douglas					12	12	14	16	14	17	61	10	8	2		20	93
Lockheed																	
1049	49,700	956-C18CA-1	WR	Eastern	5	5	9				9						14
1049	49,700	975-C18CB-1	WR	TWA				10			10						10
1049C	48,600	R-3350-34	WR	Eastern										7	9	16	16
1049C	48,600	R-3350-34	WR	Air France								3	6	1		10	10
1049C	48,000	R-3350-34	WR	KLM								6	3			9	9
1049C	48,000	R-3350-34	WR	Trans Canada											5	5	5
1049C	48,600	R-3350-34	WR	Pak Air Ltd.										1	2	3	3
Total Lockheed					5	5	9	10			19	9	9	9	16	43	67
Martin																	
404	20,800	R-2800-CB-3	P&W	Eastern	21	21	13	6	19		38						59
404	20,800	R-2800-CB-16	P&W	TWA	12	12	11	18			29						41
Total Martin					33	33	24	24	19		67						100
Convair																	
340	22,200	R-2800-CB-16	P&W	Northeast								1	1	2		4	4
340	22,200	R-2800-CB-16	P&W	United			1	6	11	9	27	3	5	3		13	40
340	22,200	R-2800-CB-16	P&W	Braniff				1	4	6	11	6	3			9	20
340	22,200	R-2800-CB-16	P&W	Hawaiian					1	3	4	1	1			2	6
340	22,200	R-2800-CB-16	P&W	Continental					1	1	2	4	1			5	7
340	22,200	R-2800-CB-16	P&W	Delta						3	3	3	3	1		7	10
340	22,200	R-2800-CB-16	P&W	Mid-Continent								1	3	2		6	6
340	22,200	R-2800-CB-16	P&W	Philippine								2	1			3	3
340	22,200	R-2800-CB-16	P&W	Aramco					2		2						2
340	22,200	R-2800-CB-16	P&W	Aero O.Y.(Fin)						1	1	1	1			2	3
340	22,200	R-2800-CB-16	P&W	Texas Co.					1		1						1
340	22,200	R-2800-CB-16	P&W	Pratt & Whitney						1	1						1
Total Convair							1	7	20	24	52	22	21	8		51	103
Sikorsky																	
S-51		R-1340-S3H3	P&W	Los Angeles Air.	1	1		1			1						2
Grand Total All Aircraft					51	51	48	58	53	41	200	41	38	19	16	114	365

requested for military plane "B" products will not cause any cut in production of military planes.

So, although DPA made cuts of from 11 to 39% in materials allotments asked for by the NPA Aircraft division, DPA officials specified that none of the cut should apply to the proportion of materials asked by civil claimants. Instead, the aircraft equipment requirements (about 95% of which were claimed by the military) should take the whole cut, DPA insisted.

▶**Aid for Civil Air**—Even the full civil airframe, propeller and engine production requirements for controlled materials do not compare with materials requirements for B Product components of military planes. Only aluminum and brass mill copper needs of whole civil planes for the next quarter are greater than the allotment of the same materials for "B" product aircraft components, of which about 95% are military planes.

The two offices primarily responsible for estimating and justifying civil aircraft materials requirements to meet DPA-approved production schedules are the NPA Aircraft division and the CAA Office of Aviation Defense Requirements. Also pitching in are the Air Coordinating Committee, Undersecretary of Commerce's office, Civil Aeronautics Board, Office of International Trade and Economic Cooperation Administration.

CAB Says Stall Caused MCA Crash

Probable cause of the Mid-Continent Airlines DC-3 crash on Mar. 2 at Sioux City, was "a stall during a left turn too close to the ground to effect recovery," the Civil Aeronautics Board says.

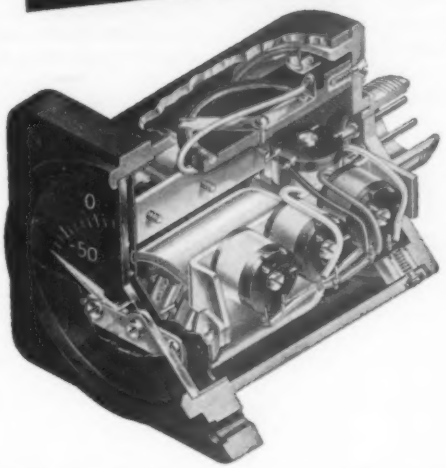
The CAB also believes "light ice may have been a factor in this accident, causing the aircraft to stall at a slightly higher than normal air speed."

Weather was 500-ft. ceiling and one-mi. visibility, the approved minimums.

The first approach to Runway 13 had been abandoned; a second approach, this time to Runway 17, was being attempted by the pilot through visual reference to the ground. Plane crashed only 600 ft. from the end of Runway 17. Survivors and ground witnesses reported hearing a substantial surge of power just before the crash occurred.

They said the plane was in a left turn, the left wing suddenly went down, the plane shuddered, full power was applied but the plane was low and did not recover from the wing-low attitude. It slipped into the ground on the left wing. Sixteen of the 25 aboard were killed.

How EDISON Indicators Save 35 Pounds



EDISON electrical resistance temperature indicators were recently specified for cylinder head indication on a new type of four-engine transport. In this installation, two dual indicators and eight bulbs were used . . . at a weight saving of *35 pounds* under the thermocouple system formerly employed.

Weight economy is only one of the many features associated exclusively with EDISON instruments. Of special interest to maintenance engineers is the ability of EDISON indicators to adapt themselves to *any* temperature measurement application. The EDISON ratiometer movement is standard for all indicators whether used for cylinder head, oil, air, heating duct, etc. This standardization permits the temperature range in any given indicator to be changed merely by substituting a new dial and a few low-cost resistors.

It will pay you to investigate this proven way to save weight and cut maintenance costs. For complete information on indicators, send for our new Bulletin #3023. And for matching resistance bulbs, ask for Bulletin #3016.

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INCORPORATED
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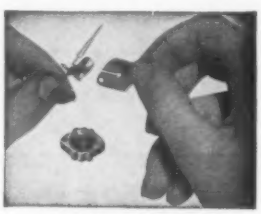
Only EDISON Temperature Indicators have all these features

READABILITY WHERE IT COUNTS
Scale is expanded at center of range where operating temperatures are located.



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Rotor is just a magnet on a steel shaft — No delicate moving coil.

EASE OF OVERHAUL
No special tools—No delicate hairsprings—Jewels easily replaced.

EASE OF CALIBRATION
Merely move the contact on a rheostat—No coil calibration.

YOU CAN ALWAYS RELY ON EDISON

Alaskan Asks CAB For Jetliner Route

Alaska Airlines, operator of three DC-4s and three DC-3s, has asked the Civil Aeronautics Board for permission to operate jet airliners from Fairbanks, Alaska, over the North Pole to Europe.

The airline is thinking of the year 1956 or later, depending on jet transport development and on the international situation.

The airline asks permission to fly regular air transport from Fairbanks to Paris via Oslo and London.

Earlier this year, President Truman overruled a CAB vote denying Alaskan's request for route extension from Alaska to Seattle/Portland.

Meanwhile, Col. Bernt Balchen, pioneer flyer recently with the Alaskan Air Command, has told the American Society of Civil Engineers that commercial planes in a few years will be flying over the top of the world on routine passenger service between the West Coast and Europe. Special navigational and emergency survival equipment and temporary-type emergency airfields will be needed for commercial operation, he says. But he pointed out that polar flights are being made by military planes.

SHORTLINES

► **Aer Lingus,** Irish Government airline, plans to buy bigger planes than its present DC-3s. It has sent seven officials to the U. S. to study U. S. airline equipment and operations. Visits will wind up at year's end.

► **Air France** will serve Miami, New York-Houston-Mexico City, and Guadaloupe-Martinique-New York, if CAB approves the recommendation of its examiner, Curtis C. Henderson.

► **Air Line Pilots Assn.** is asking CAA to review all previously issued waivers from Civil Air Regulations granted airlines on flight operations and maintenance. These should be reviewed "in light of the general campaign now underway to tighten up on safety," an ALPA spokesman says.

► **American Airlines** voted payment of the regular quarterly dividend of 87½ cents a share on $3.50 cumulative preferred to holders of record Nov. 15.

► **British Overseas Airways** is reported considering selling some of its Handley Page Hermes airliners to a private charter firm. About 20 of the four-engine transports are in operation on the African runs. Reason suggested for sale is replacement by the jet-powered Comet.

► **C&S** and National Airlines have asked CAB to let them run a one-plane service Houston-Miami via Interchange at New Orleans. C&S also wants CAB to take restriction off its Houston-New Orleans route.

► **Civil Aeronautics Board** Chairman Donald Nyrop and ATA engineering and maintenance chief, Al W. Dallas, are programming installation of flight recorders on airliners. ATA has tested both the General Electric and the Hathaway Instrument Co. units. . . . Has started investigation to determine if air freight charges based on weight without regard to bulk is unjust, unreasonable, discriminatory, or preferential, as alleged by Flying Tiger Line, Slick Airways and TWA. Such type freight tariff was filed by American, Flying Tiger and United; CAB suspended it pending investigation.

► **Colonial Airlines** will contract for its publicity and advertising with an independent firm; former vice president-publicity, A. M. Hudson, has left the company.

► **Continental Air Lines** plans to use

High signs for 89's

Northrop is a good place to work . . . good people work at Northrop! The fine morale and high caliber of Northrop personnel have been responsible for many production feats in the company's history.

During World War II it was the P-61 Black Widow. Today it's the deadly Scorpion F-89—fast, heavily armed, electronic-search equipped—the standard all-weather interceptor of the USAF.

Northrop has many new positions. Your applications invited.

Northrop Aircraft Inc.,

PIONEER BUILDERS OF NIGHT

two newly ordered DC-6Bs on the American Airlines interchange from Houston to Los Angeles and San Francisco, when the planes are ordered in 1953.

▶**Delta Air Lines** reports net profit of $385,000, or 77 cents a share, for the quarter ended Sept. 30, compared with $217,857 a year ago.

▶**Eastern Air Lines** starts training pilots and ground crews for operation of Super Constellations and Martin 4-0-4s this month.

▶**KLM Royal Dutch Airlines** has signed an air-sea travel agreement with Farrell Lines, giving roundtrip discount on joint ticket.

▶**Miami International Airport** has ordered 185 high intensity runway lights and 760 taxiway lights and controls from Line Material Co. for new 9,400-ft. runway, 8,400-ft. runway extension, and complex taxiway system.

▶**Military Air Transport Service** is pressing for procurement of twin-engine planes to avoid potential pinch on U. S. military air transport in stepped-up mobilization. Transcontinental and interdepot operations were cut back two years ago in government economy drive. No new planes of the short-haul, small airfield type have been acquired since. . . . MATS gets its new commander, Maj. Gen. Joseph Smith, Nov. 15. . . . Will replace Stratofreighters (C-97s) going to Strategic Air Command, with Douglas DC-6As (C-118Bs).

▶**O'Hare Airport,** Chicago, will get majority of Chicago's scheduled airline traffic when and if programmed construction is finished, "provided that satisfactory contracts as to the use of that airport can be worked out between the airlines and the city," says committee of representatives of airlines serving Chicago.

▶**Pan American-Grace Airways** has CAB show cause order for temporary mail pay rate of 30 cents a seat mile, retroactive to Oct. 1.

▶**Seaboard and Western Airlines** DC-4 has moved three 4,100-lb. J-35 jet engines to Frankfurt, Germany, from Westover AFB, Mass., in single flight under Air Force contract.

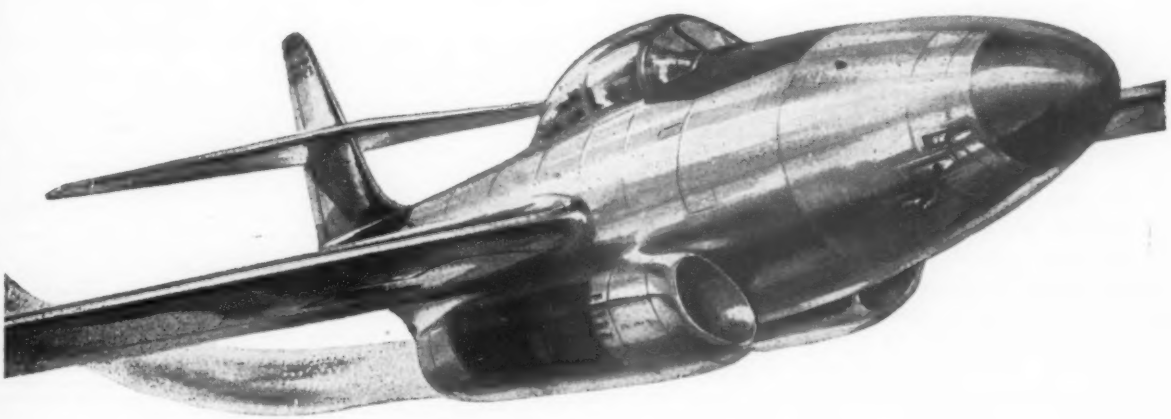
▶**Transocean Air Lines** this month returns 40 Indonesian air cadets to home service after year's military flight training by Transocean under contract from the Indonesian government. Transocean will give remaining 20 cadets an advanced course to become flight instructors.

▶**Trans World Airlines** revenue passenger miles to Sept. 30 are up 31% over a year ago, to 1,423,188,000. Cargo ton miles are up 26%, to 34,147,000.

▶**Undersecretary for Transportation** office will have ready an outline of the airline war risk insurance program this week. Chief architects are Air Coordinating Committee executive secretary Charles Cary and Commerce Undersecretary Delos Rentzel's executive assistant, R. B. Kirsner.

▶**United Air Lines** has ordered two more Douglas DC-6Bs. That makes 22 of the 58-passenger planes for United, including seven delivered. Delivery is scheduled for 1952 and 1953.

▶**U. S. Airlines** has signed an interline agreement to carry air freight for Pan American and Panagra on its eastern U. S. north-south route. . . . Has opened a receiving station for freight in warehouse used by Slick Airways at Idlewild Airport, N. Y.



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P-2279, Aviation Week
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Minimum Requirements:
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5. Multi-engine water time desirable.
6. Flights lasting 2 weeks not uncommon.
7. Must be quiet and neat.
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9. Salary open.

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P-2366, Aviation Week
68 Post St., San Francisco 4, Calif.

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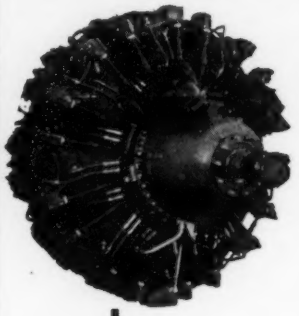

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20	TA-12B	Transmitter
150	DA-1F	Dynamotor

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130	8288	Follower Ass'y
814	35814	Blower Ass'y
182	46400E	Liner
30	48346	Cylinder
53	48362	Shaft
175	48363	Shaft
56	48392	Sump
390	48461	Gear
78	76236	Gear
1178	84289	Bearing
113	84487	Housing
77	84591C	Nose Housing
200	48350-D	Crankcase Ass'y
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28000	KS6A
34600	NR6L12
7000	38KD4
6600	RE3MR3
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161	420 EC
160	420 DY
26	550 CD
14	550 CG
195	550 AJ
195	550 CP
104	550 EC

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Quantity	Part No.	Mfg.
53	AN6203-3	Bendix-10"-1500 P.S.I.

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Quantity	Part No.	Mfg.
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800	AN3096-5	Grimes (Red)
380	AN3096-6	Grimes (Green)

VALVES

Quantity	Part No.	Mfg.
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233	D9530	Adel
428	D9560-2	Adel
744	D10044	Adel
2200	AN4078-1	United Aircraft (Oil Dilution)
50	572-3A	Eclipse
244	D10051	Adel

BLOWERS

Quantity	Part No.	Mfg.
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16	125J-6	Dynamic Air Eng.
43	4582-AA-6C	Dynamic Air Eng.
24	8861G-6C	Dynamic Air Eng.

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38	18597-2	Airesearch	Aluminum (Width 8") (Length 9")

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230	MF9-713-15A	Vickers	Hydraulic
90	AN6102-1(8818-2)	Adel	Fuel
160	2E492E	Pesco	Fuel
700	TFD 8600	Thompson	Fuel Booster
125	D7818	Adel	Anti-icer
170	2P771-A	Pesco	Fuel Booster
250	AN4014	Erie Meter	Wobble (D-3)
300	1H260-K & KA	Pesco	Hydraulic

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19	AN5531-1	G. E.	Tach. Generator
1000	AN5780-2	G. E.	Wheel & Flap Position Indicator
400	AN5780-2	Weston	Same as above
1000	AW2-65B	U. S. Gauge	Air Pressure Gauge
16	76B19	Lewis Eng.	Cyl. Head Temp.
10	46B2	Lewis Eng.	Air Temp. Ind.
31	47B21	Lewis Eng.	Temperature Ind.
12	47B22	Lewis Eng.	Temperature Ind.
20	47B23	Lewis Eng.	Temperature Ind.
36	47B24	Lewis Eng.	Temperature Ind.
10	76Z2	Lewis Eng.	Air Temp. Ind.
11	76B4	Lewis Eng.	Temperature Ind.
20	77C4	Lewis Eng.	Temperature Ind.
21	77C5	Lewis Eng.	Temperature Ind.
85	727TY72Z2	Weston	Left Wing Anti-icing
88	727TY73Z2	Weston	Right Wing Anti-icing
83	727TY74Z2	Weston	Tail Anti-icing
11	2227-11D-3A	Eclipse	Dual Tachometer
22	8DJ-29-AAY	G. E.	Indicator (Cowl Flap)
45	254BK-6-052	Kollsman	Differential Pressure Ga.
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8	14601-1G-B1	Eclipse	Altitude Gyro
22	15100-1B	Eclipse	Pitch Trim Ind.
10	20000-8A-14	Eclipse	Magnesym Position Ind.
23	20100-11C-4-A1	Eclipse	Magnesym Wing Flap Ind.
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116	A371205	Dumore	Motor
780	A371206	Dumore	Motor
115	P4CA2A	Parker	Primer
80	AN3213-1	Scintilla	Ignition Switch
568	A-9 (94-32226)	Nasco	Ignition Switch
687	RS-2	Mallory	Selector Box
90	JH950-R	Jack & Heintz	Starter Motor
492	S-841 (94-32253)	Electronic Labs	Box
6	FA122	Wallace & Tiernan	Flasher
1000	T3018-A	Bendix	Interphone Boz
140	K14949E	Marquette	Windshield Wiper Kit
73	3123-3A	Eclipse	Warning Unit
188	EYLC-2334	Barber-Colman	Control
11	12086-1C	Eclipse	Amplifier
174	450-0	Skinner	Gasoline Filter
250	558-1A	Eclipse	Oil Separator
100	564-2A	Eclipse	Oil Separator
100	716-3A	Eclipse	Generator (NEA-3A)
5	656536-421	Sperry	Controller Pedestal (A-12)
37	117-47	Edison	Detector
89	318	Edwards	Horn
280	921-B	Stewart-Warner	Heater (200000 BTU)
340	981280	Kidde	Co2 Cylinder
85	12924-2	Adel	Lock Valve
90	923748	Kidde	Oxygen Cylinder
80	DW28	Eclipse	Transformer
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22	0655-D	Aro	Oxygen Regulator
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95	UA-3160C	United Air Prod.	Oil Temp. Reg. 6"
73	UA-6007-CF-DV5	United Air Prod.	Oil Temp. Reg. 7"
14	UA-6009-S-30	United Air Prod.	Oil Temp. Reg. 9"
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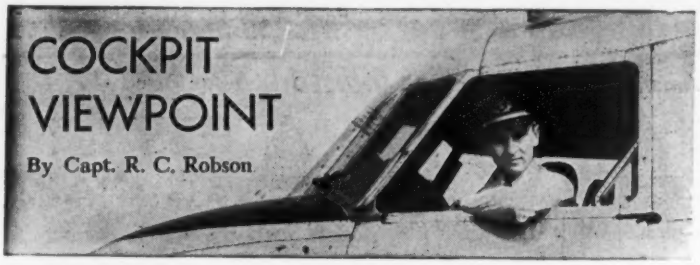

Incident Prevention Is Accident Prevention

In aviation nearly everybody reads the *accident* reports. Not so with *incident* reports. (Aeronautically speaking *incident* is merely the diminutive form of *accident*.)

When a pilot reports an incident the facts as a rule are not widely circulated. Many of these reports provide a clear insight to the problems encountered in a cockpit and a great deal can, and should, be learned from them.

►**A Pilot Reports**—Following is a pilot's report on an *incident*, presented verbatim. This insures accuracy and gives a blunt, blow-by-blow description more forceful than any re-write job could be.

"On arrival Chicago, an ILS approach was made. Weather reported as I passed the outer marker was 600 ft. scattered, one mile, fog and smoke. Observed from the cockpit, the top of the fog and smoke was about 500 ft. I had vertical visibility at all times and the glow of the high intensity approach lights was visible throughout the approach.

"Just prior to arriving over the approach lights at about 400 ft. they, and the first portion of the runway lights, were visible so I called for full flaps and reduced power for landing.

"Because of the restricted visibility and the extreme light contrast between the high intensity approach lights and the runway lights (accentuated by the fog) I had difficulty in determining my height above the runway and made a power on landing.

"An estimated one-third of the runway passed beneath me and I was still airborne, so I closed the throttles and the plane dropped onto the runway hard enough to swerve to the right. I reversed the props and, as the ship had not yet settled solidly onto the runway, I permitted it to continue through the line of runway lights on a straight course, considering it more advantageous to continue straight and level until I had it firmly maneuverable on the ground.

"At the time of contact the runway lights (about ½ mile) were the only ground contact I had and the lack of other references was a major factor in my decision to continue on a straight course rather than maneuver to regain the runway.

"With no reference horizon, and with the ship in motion just short of flying speed, I believe any maneuver to remain on the runway would have risked dragging a wing and a major accident and would probably have damaged quite a number of runway lights. I completed the landing on the sod to the right of runway 13R and returned to the pavement on 9R. Visibility as observed was ½ mile, improving in the southeast portion of the airport."

Readers of this column have by now recognized this subject as being an old story. But few things compare with the sensation of diving into the black hole of an airport.

►**Pilot's Dilemma**—It is not possible for the pilot to know, beforehand, what conditions will exist on the runway. His only recourse is to go down and see. As in the reported incident, a pilot, using good technique and sound judgment, can legally get into a precarious position. So the answer does not lie in further prohibitive measures.

Landings must be made—safely—under these, and worse, conditions. Let's therefore improve airport lighting arrangements so the pilot can see. And let's paint reference marks on the runway so the pilot can steer a straight course. And let's do it **NOW.**

Incidents like this happen every day. They are but a hair short of being headline material. It is unfortunate that the industry continues to babble on about all-weather flying when a few buckets of paint and some better lights would solve a large part of the problem.

WHAT'S NEW

New Publications

Army Aviation Guide is a 26-page illustrated booklet discussing liaison operations, equipment used and many of the regulations which outline Army aviation's mission.

Cruise Control for Low Powered Airplanes runs 27 pages, also has three charts from which cruise control data for the Cessna 140A, 170A and 195 can be developed.

Both are written by Max Daggett, Jr., and published by Air Service and Engineering, P. O. Box 2715, Little Rock, Ark. Price of the former is $2.00, of the latter, $1.00.

Telling the Market

Aerial Surveys and Maps from Photographs is a new booklet explaining in non-technical language the technique of aerial surveying. Write Abrams Aerial Survey Corp., 606 E. Shiawassee St., Lansing 1, Mich. . . . Torque testing equipment and torque tools made by Richmont, Inc., are covered in a new booklet, **Proper Torque,** available from the firm at 808 W. Santa Anita, San Gabriel, Calif.

Technical advice on O-ring sealing is available to designers and users of this type seal by the Arrowhead Rubber Co., which is issuing data sheets describing their products. The address is Ring Technical Service, Arrowhead Rubber Co., Downey, Calif. . . . Ready reference to many deVilbiss types of spray equipment can be found in new 16-page brochure available by writing the company's Spray Painting Equipment division at Toledo 1, Ohio.

Booklet GEC-809 gives data on General Electric fixed paper-dielectric capacitors, including operation and application. Write GE, Schenectady 5, N. Y. . . . **The How Book of Cost Cutting Materials Handling** is a 24-page booklet including a comprehensive plan for evaluating present handling methods through an engineering analysis much like a time-and-motion study. Write Yale & Towne Mfg. Co., 11,000 Roosevelt Blvd., Philadelphia 15, Pa. . . . . A very complete 125-page spiral-bound brochure, **Multi-Metal Catalog 50,** contains full listings and illustrations of wire cloth, filter cloth and fabricated products, an engineering design section and a technical data section. There also is a report on 18 months of research into the flow characteristics and particle retentivity of metallic filter cloths. Write Multi-Metal Wire Cloth Co., Inc., 1350 Garrison Ave., N. Y. 50, N. Y.

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EDITORIAL

How About Meeting Issues?

For several years on this page, from time to time, we have taken to task some of the major scheduled airlines. These were earnest efforts at constructive criticism. In our book, when someone in aviation does not seem to be doing his best to improve aviation's service to the public, we say so; when others do take progressive steps, we say so, too. Sometimes the nonskeds have won praise.

We have urged the major carriers to cut fares instead of raising them; to attract new, previously nonflying patrons, to take a tolerant attitude toward new passenger and cargo competition by trying to outdo their competitors instead of bulldozing or stifling them. The major carriers have tried repeatedly to stall progress—rather than promote it—by filing interminable legal briefs in government agencies, going into courts to obfuscate issues rather than meeting them.

It isn't news any more when we say all this. But it is news when one of our long-disagreeing contemporaries says it, especially American Aviation. It has been several weeks since a memorable editorial appeared in American Aviation, written by Wayne W. Parrish, its editor and publisher. Even with this perspective of time, we still think it is worth repeating here. Although we disagree with its praise of CAB on the issue, we reproduce it in full:

Lost Opportunity

When the history of postwar air transport is compiled, one of the strangest developments to be chronicled will be the attitude and/or inertia of the certificated scheduled air carriers toward the entire non-scheduled and air coach problem.

It is certainly crystal clear that the certificated airlines have a vital stake in the development of an economically sound air transport system. The value of a certificate of public convenience and necessity is unquestioned, and the best continuing proof of this is the running battles fought among the carriers themselves for protecting or extending these certificates before the Civil Aeronautics Board.

Yet the record shows that the certificated carriers have sat back ever since the rise of the nonskeds in 1946 and let the CAB carry the ball for the protection of these valuable franchises. The certificated carriers have grumbled, griped and groaned, as might be expected, but they have largely passed the buck to the CAB as if they themselves were only vaguely concerned with the problem.

The public relations aspect has been neglected almost completely, but not because the matter hadn't been called to the attention of the carriers. Arthur Kelly, vice president-sales of the pioneer airline, Western, proposed almost two years ago that the certificated carriers identify themselves in advertising with an emblem which would make it possible for the traveling public to distinguish between the certificated operators and the nonskeds. But this and other suggestions fell on deaf ears.

The main attack on the nonsked problem has been in the form of legal petitions and complaints by the certificated carriers. Truly constructive corrective measures have been absent. The public, in the meantime, has been left in a state of confusion, both as regards the distinguishing features between the two types of carriers and as regards the reasons for fare differentials.

But quite apart from the relationship of the certificated carriers with the public, press and Congress, there was another step which could have been taken which would have gone a long way to solve the nonsked problem. Many carriers have been short of equipment, specially when the Korean air lift demands were made. But instead of buying up the nonsked equipment, even at premium prices (which could have been liquidated in a short time during the current traffic boom), the airlines simply cut schedules and the bulk of these schedules were for cargo at a time when cargo traffic was getting heavier. The shortage of airplanes in the certificated industry has been more artificial than real.

Meantime, the CAB has been taking a beating because of the nonsked situation. Far from being the servant of the certificated industry, the CAB was established to be a regulatory agency for the public. The CAB must listen to the public and to Congress and so far it has done an admirable job, especially in the light of constant legalistic complaints from the certificated carriers, in holding the line for the protection of a sound air transport industry, the latter being definitely in the public interest anyway.

In getting their story over effectively, the nonskeds have outflanked and outmaneuvered the certificated carriers right down the line. The fault does not rest with the Air Transport Assn., which is doing an excellent job under the circumstances, but with the certificated carriers themselves who have a story and have hardly budged an inch in telling it.

Even in the lower-fare air coach field some of the certificated carriers were slow to sense the trend of public thinking. The initiative of Capital Airlines, which led the way in air coach in the face of much skepticism (including ours), is to be commended most highly, while American Airlines subsequently led the way transcontinentally and National Airlines sized up the situation wisely on the East Coast. The last holdout was United Air Lines which finally starts transcontinental coach service Sept. 30, although it had reluctantly entered the San Francisco-Los Angeles coach market sometime ago due primarily to competitive factors.

There are economics in air transportation which aren't easily understood by the lay public or by a Congress under pressure from skillfully directed propaganda machines. The certificated carriers have a good case. But they have already missed, in the past five years, the greatest opportunity they will ever have to get their story across on the offensive. From now on it will be a problem of meeting one crisis after another, of being on the defensive, of putting out fires that might never have been started. They have succeeded in rather magnificent fashion, too, in alienating a great many friends both in government and out. To put it mildly, the time is getting a little late.

We might add that signs are increasing that the industry is in danger also of losing the initiative on explaining to the public what, if anything, is being done on (1) the matter of airplane noise, and (2) the matter of anti-collision and navigational airborne radar, to name only two growing public relations problems. We agree with Mr. Parrish's contention that it is the job of the individual members of the ATA—not the ATA itself—which should have done something about recognizing the nonsked situation vis-a-vis the public. We say the same for the two additional problems noted above. They are becoming more acute day by day.

—Robert H. Wood